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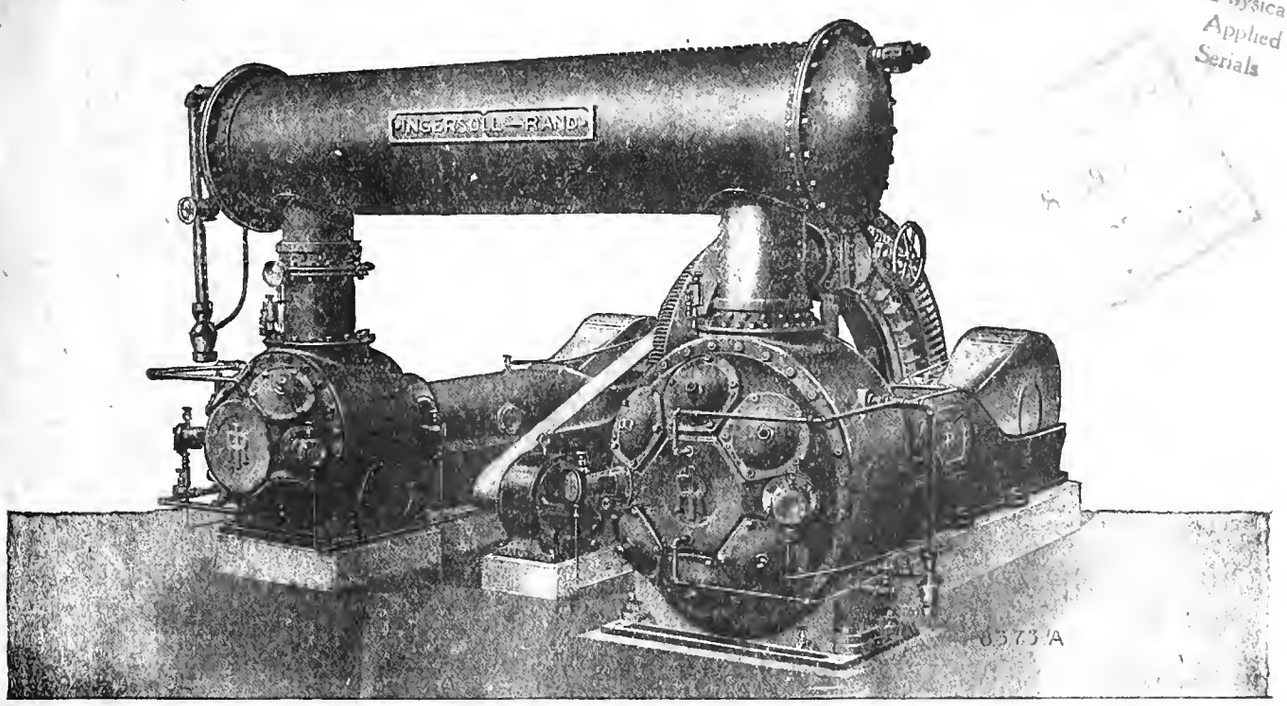

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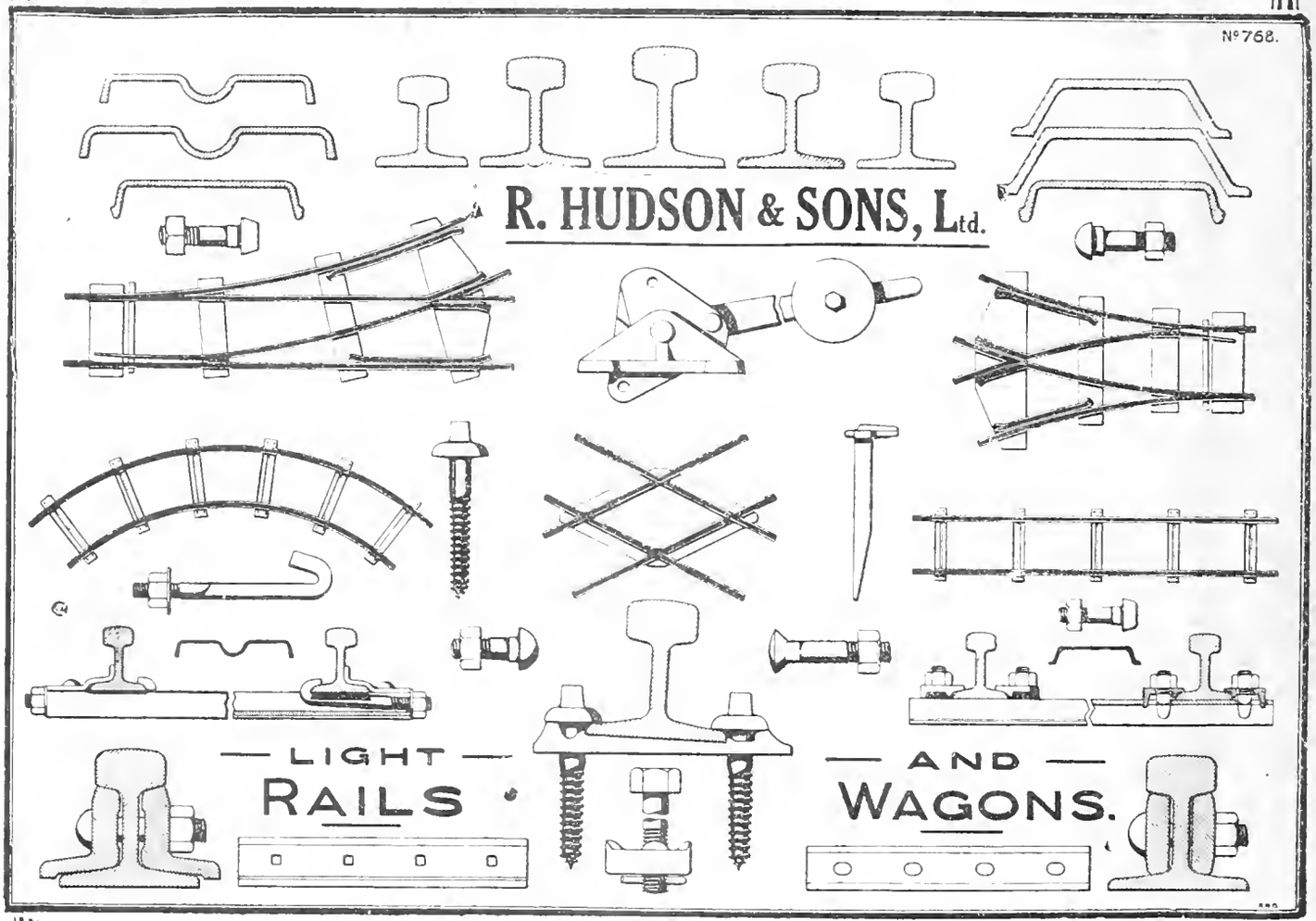

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INDEX

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ANALYSIS OF INDEX.

List of Principal Headings in the following Index, with pages on which they may be found.

	PAGE
ANNUAL AND EXTRAORDINARY GENERAL MEETINGS AND REPORTS	i.
CONTRIBUTED ARTICLES	ii.
CORRESPONDENCE	ii.
DIVIDENDS	ii.
GENERAL INDEX	ii., iii., iv.
ILLUSTRATIONS AND MAPS	iv.
LEADING ARTICLES	iv.
MONTHLY REPORTS	iv., v
QUARTERLY REPORTS	iv., v.
SPECIAL ARTICLES	v.
STATISTICS	v.
OUTPUTS	v.

ANNUAL AND EXTRAORDINARY GENERAL MEETINGS AND REPORTS.

African Banking Corporation, Ltd., 556
African and European Investment Co., Ltd., 457
African Land and Investment Co., 118
African Life Assurance Society, Ltd., The, 554
Afrikander Proprietary Gold Mines, Ltd., 112
Anglo-French Land Company of the Transvaal, Ltd., 43, 70
Anglo-French Matabeleland, 463

Balkis, Ltd., 385
Bantjes Consolidated, 525
Base Minerals, 117
Beira Junction Railway, 445
Beira Railway Co., Ltd., 282
Bell Reef Development Co., 24
Blaauwbosch Diamonds, Ltd., 431
Brakpan Ore Reserves, 521
Breyten Collieries, Ltd., 404
Brick and Potteries, 140
Bulawayo and General Exploration Co. (1906), Ltd., 282
Bushveld Tin Mines, Ltd., 458
Bwana M'Kubwa Copper Mining Co., 586

Cape Copper Co., Ltd., 505, 584
Carolina Asbestos Co., Ltd., 340, 405
Chamber of Mines, 112, 408
Clydesdale (Transvaal) Collieries, Ltd., The, 260
Companhia de Mocambique, 264
Consolidated Gold Fields of South Africa, Ltd., 237, 285, 429
Consolidated Main Reef Mines and Estate, Ltd., 330
Coronation Collieries, 140

Daggafontein Mines, Ltd., 404
Daggafontein Prospecting Syndicate, Ltd., 556
Delagoa Bay Development Corporation, Ltd., 385
De Beers Consolidated Mines, Ltd., 359

East Rand Gold and Coal Co., 140
East Rand Mining Estates, Ltd., 383
Eileen Alannah Mining Co., 190
Elandsfontein Estate, Ltd., 405
Enterprise Gold Mining and Estates, 599

Fairview (T.C.L.), Ltd., 64
Frank Smith Diamond Estates and Exploration Co., Ltd., 584
Fraser and Chalmers, Ltd., 432

Gaika Gold Mining Co., 328
Geduld Ore Reserves, 539
Geological Society Annual Meeting, 522
Giant Mines of Rhodesia, 586
Glynn's Lydenburg, Ltd., 307
Golden Kopje Proprietary, 68

H.E. Proprietary (New), 586

Insiza Mines, Ltd., 419

Johannesburg Board of Executors and Trust Co., Ltd., 334
Johannesburg Consolidated Investment Co., 302
Johannesburg Gold Fields, Ltd., 568
Jumbo G.M. Co., 386

Kamfersdam Mines, Ltd., 555
Kleinfontein Estates and Township, Ltd., 140
Klerksdorp Proprietary Mines, Ltd., 88
Knights Deep, Ltd., 235
Koffyfontein Mines, Ltd., 392

Lace Proprietary Mines, Ltd., 307
Langlaagte Estate and G.M. Co., Ltd., 494
Luipaardsvlei Estates and G.M. Co., Ltd., 457

Machavie G.M. Co., Ltd., 236
Main Reef West, Ltd., 142, 329
Matabele Queen's Company, Ltd., 369
Mauss Continuous Centrifugal Separator, Ltd., 405
Mayo (Rhodesia) Development Co. (1908), Ltd., 385, 440
McCreedy Tin Mines (Swaziland), 112
Messina (Transvaal) Development Co., Ltd., 412, 496
Middelburg Steam Coal and Coke Co., 365, 383
Modder Deep Ore Reserves, 521
Monteleo Diamonds, Ltd., 364
Mozambique Macequece, 465

Natal Navigation Collieries, Ltd., 180
Native Recruiting Corporation, Ltd., 160
New Areachap Copper Mines, Ltd., 362
New Boksburg Gold Mines, Ltd., 160
New Geduld Deep, Ltd., 363
New Lisbon-Berlyn, Ltd., 561, 594

New Modderfontein G.M. Co., Ltd., 330
New Rhodesia District Development Co., Ltd., 438
New Rhodesia Mines, Ltd., 162, 263
New Thor Diamond Mining Co., Ltd , 432
North Charterland Exploration Co. (1910), Ltd., 198
Northern Minerals (Transvaal), Ltd., 376
Nourse Mines, Ltd., 333

Oceana Consolidated Co., 386
Oceana Development Co., Ltd., 606

Phoenix Gold Mines, Ltd., 555
Piggs Peak Development Co., 540
Pniels, Ltd., 431
Pretoria Estates, Ltd., 376

Randfontein Central G.M. Co., 494
Randfontein Estates G.M. Co., 496
Rand Klip, Ltd., 111
Reuter's Telegram Co., Ltd., 443
Rhodesia Copper and General Exploration and Finance Co., Ltd., 118
Rhodesian Broken Hill Development Co., 576
Rhodesian Gold Fields Development, 3
Rhodesia Railways, 46
Rhodesia Railways Trust, 91
Rooiberg Minerals Development Co., Ltd., 283
Ryan Nigel G.M. and Estate Co., Ltd., 95

S.A. Alkali, Ltd., 432
S.A. Diamond Corporation, Ltd., 391, 430
Scottish Mashonaland G.M. Co., 238
Selukwe Columbia Gold, 433
Shamva Mines, Ltd., 55
Sheba Gold Mining Co., Ltd., 555
Simmer and Jack, Ltd., 109
South African Option Syndicate, Ltd., 370
Southern Van Ryn Deep G.M. Co., Ltd., 64, 333
South-West Africa Co., Ltd., 23, 46, 67
Spitzkop Farm Gold Co., Ltd., 413
Stellenbosch District Bank, 507
Stuttaford and Co., Ltd., 282
Sub-Nigel G.M. Co., Ltd., 108
Surprise Gold Mining Co., Ltd., 375
Swaziland Affairs, 286
Swaziland Tin, Ltd., 64

Tanganyika Co., The, 393
"Tank" and Zambesi Reports 264
Transvaal and Delagoa Bay Investment Co., Ltd., 361
Transvaal Gold Mining Estates, Ltd., 43, 87
Transvaal Oil Shale Syndicate, 539
Transvaal and Rhodesian Estates, 54

United African Lands, 436

Van Ryn Gold Mines Estate, Ltd., 556
Verdite Mines, Ltd., 18, 261
Victoria Falls and Transvaal, Power Co., Ltd., 179
Vryheid (Natal) Railway Coal and Iron Co., Ltd., 18

Wanderer (Selukwe) Gold Mines, Ltd., 25
Wankie Colliery Co., Ltd., 562
Welgedacht Exploration, The Year with the, 542
Western Rand Estates, Ltd., 235
Willoughby's Consolidated Co., 68
Witbank Collieries, Ltd., 537
Witwatersrand Commercial Exchange, 19
Worcester G.M. Co., 599

Zaaiplaats Tin Mining Co., Ltd., 407

CONTRIBUTED ARTICLES.

Carbonisation of Coal, With By-Product Recovery, as a South African Industry, The Prospects of the, (Bilbrough), 200, 233, 256, 276

Chemical Industry, Recent Advances in, (Wilkinson), 74, 97, 130, 174, 203

Comparison of Ward-Leonard and Three-Phase Winding Systems (Ewing), 558

Efficiencies and Costs of Steam and Electric Winding Plant (Clayden), 535

Electrical System of the Rand Power Companies, with Special Reference to Methods of Operation and Experience (Price), 299, 335, 379, 401, 427, 455, 477, 489, 517

Finance after the War (Wilson-Fox), 219

Flotation Concentration Experiments on a Transvaal Gold Ore (Wartenweiler), 444

New Power Station at Piggs Peak, The, (Contributed), 313

Oil Shales in Impendhle County, Natal, Report on the,(Du Toit), 193

Orange River Diamond Fields, The, (Wagner), 564, 589

Ore Treatment at the Falcon Mine (Rhodesia), (Adam), 421

Physical Culture and Miners' Phthisis (Beaven and Morgan), 5

Recent Developments near Lydenburg (Howard), 392

Simple Method of Sizeing Ore for Tube Milling—The Dumb-Bell Tube Mill (Robertson), 357

Transvaal Coal, Increased Importance of the (Correspondent), 482

Transvaal Mining in 1916 (Marriott), 591

Wave-Transmission System and its Use in Drilling, The, (Weston), 601

CORRESPONDENCE.

Daggafontein Conversion, 50

Far Eastern Rand Geology, 225

Far East Investments, 169

Industrial Development, 78

Kleinfontein, 319

Location of an Upcast Shaft, The, 531

New Kleinfontein, 78

New Kleinfontein Profits, 269

New Kleinfontein Prospects, 355

New Ophir Gold Mining Co., Ltd., 512

New Rietfontein or Du Preez Reef Series, The, 511

Oceana Development Co., 596

Our Sailors, 450

Rand Klip and Cloverfield, 319

Rand and the University Question, The, 509

Rietfontein Series, The, 488

State Mining and the Labour Party, 269

Troyeville Election and the University Question, The, 486

DIVIDENDS.

Dividend List, The Half-year's, 375

Durban-Roodepoort G.M. Co., Ltd., 370

Ferreira Deep, Ltd., 65, vi.

Globe and Phoenix G.M. Co., Ltd., 310

Natal Navigation Collieries and Estate Co., Ltd., The, 409, iv.

Natal-Zululand Railway Co., 238

New Era Consolidated, Ltd., The, 384, i.

New Heriot Gold Mining Co., Ltd., 370

Premier (Transvaal) Diamond Mining Co., Ltd., 237, 479

Raod Mines, Ltd., 389

Rand Selection Corporation, Ltd., 384, i.

Rand Water Board (Engineer's Department), 409, iv.

Rhodesian Mining Dividends, 585

Transvaal Gold Mining Estates, Ltd., 65, vi.

Transvaal Gold Mines Dividends, The Year's, 389

Welgedacht Exploration Co., Ltd., 424

Witbank Colliery, Ltd., 576

Wolhuter Gold Mines, Ltd., The, 160, vii.

Year's Dividends, The, 441

Year's Transvaal Gold Mine Dividends, The, 419

GENERAL INDEX.

Acetylene and Candles, 265
A.E.G. Electric Co., Purchase of, 372
African Banking Corporation, Ltd., 539
African and European Investment Co., 389
African Metals Syndicate, Ltd., 520
After the War—An American View, 129
Agricultural Implements, 135
Agricultural Machinery, 35
Air Compressors, Efficiency of, 568
Alcohol-Benzol for Automatic Fuel, 290
Algoa Mining Company, 126
Aliwal Diamond Rush, 585
Aliwal North Diamond Diggings, 479, 540
Aliwal North Diamonds, 198
Aliwal North Diamonds, The Government and, 480
Amalgamated Properties of Rhodesia, 257
American Bureau of Mining Economics, 25
American Export Trade Investigations, 215
American Shipping, 157, 597
American Shipping Freights, 273
American Trade, The, 13, 321
Antimony, Ltd., 149
Antimony Ore, Sale of, 413
Australian Capital for the Far East Rand, 263

Bantjes Position, The, 479
Base Metal Supplies, 438
Benzol Supply after the War, 160
"Big House" Changes, 485
Black Reef, 202
Blue Lime and Cement ever increasing, 227
Boiler Tubes, 473
Brakpan Government Lease, The, 340
Brakpan Mines Accident, 366
Brazilian Diamonds, 425
Break with America, The, 551
Breyten Collieries, The Year with, 344
British De-Tinning Co., The, 393
British Electrical Industry, The, 182
British Empire Producers' Organisation, 310
British Industries Fairs, 1917, 478
British Interests in Enemy Countries, 47
British Mannesman Tube Co., Ltd., 88
British Money for British Industries, 412
British Trade Bank, The, 239
British Trade Mark, Proposed, 189
Broken Hill Lead and Zinc, 239
Brushware Scarce, 227
Building New Ships in Britain, 99
Building Prospects Improving, 35
Business Quite Good, 533
Butters, The late Harry, 161
Buying and Selling, 473
By-Product Recovery in the U.S.A., 186
By-Products Industry, The, 118

Cam and Motor, 435
Cam and Motor Development, 12
Canning Factory in Mashonaland, 596
Capetown Water Supply, 412
Capital and Labour, 10
C.B.R. Gold Fields in Liquidation, The, 571
Cement, How to Store, 106
Central Clearing House for Machinery, 313
Central Minings, 264
Change-Houses for Miners, 190
Coal By-Products, 339

Coal Mines very Busy, 377
Coal Research, 286
Coke Industry taking a Lead, 491
Commercial Community, Warning to the, 59
Commercial Congress at Capetown, 59
Commercial Exchange, Better Tone on, 513
Companhia do Nyassa, 319
Companies Struck Off, 196
Consolidated Investment Meeting, 207
Consolidated Main Reef, 141, 385
Copper Cable Position, 251
Copper, Enormous Orders for, 264
Copper Goods, Quiet Speculation in, 397
Copper Ores, 596
Copper Outlook, The, 238, 318
Crown Mines, 141
Crown Mines' Shaft—Sinking Record, 117

Daggafontein Mines, Ltd., 299
Daylight Saving, 79
Daylight Saving Start, 157
Death of Dr. George Turner, 220
De Beers and Koffyfontein, 23
De Beers Sending Big Orders, 533
Diamond Market, The, 91, 142
Diamond Mines Buying, 321
Diamond, Origin of the, 190
Diamond Outlook, The, 263
Diamonds, 50, 370
Diamonds, Brisk Enquiry for, 365
Diamond Trade, The, 118
Disinfecting by Electricity, 172
Double Income Tax, 387
Durban Corporation's Electrical Undertaking, 599

East Rand Mining Estates, Ltd., 285, 311
Economic Geology and Mining, 480
Electrical Goods from Japan, 13
Electrical Goods Sharply in Demand, 473
Electrical Industry, The Future of the, 22
Electricity in the Chemical Industries, 250
Electric Plant for Maritzburg, Additional, 571
Electric Transport on the Rand, 106
Electric Vehicles, 139
Electrification of S.A. Railways, 309
Empire Development, 522
Enemy Concerns now and after the War, 46
Enemy Holdings of Kaffirs, 119
Enemy Trading, 177, 214
Engineering Shops, New Work Expected for, 251
Engineers and the Question of a Truce, 440
E.R.P.M. Dividend Passed, 390
Excellent Business Year, An, 397
Explosives and Glycerine, 95
Explosives and Mining Practice, Low Grade, 149

Far East Boring, 435
Far East Boring, More, 67
Far Eastern Rand, The, 353
Far East Rand and America, 161
Far East Rand Areas and the Nationalists, The, 269
Far East Rand Map, A New 189
Federation of British Industries, The, 265
Fixation of Nitrogen, 169
Flotation, An Important, 75
Foreign Firms on the British Black List, 317
Forging Nails and Dog Spikes from Worn-out Wire Rope, 139
Fraser and Chalmers' Recovery, 414
Free Market Assured for the Mines, 491
Freight Rates, Extraordinary, 353
Freights and the New Submarine Menace, 157
Freights Stationary, 35
From France, 69
Fuse and Detonators, 157

Galvanised Iron, Big Orders for, 513
Galvanised Iron Very Uncertain, 551
Geduld Pegging Case, The, 90
Geduld, Pegging on, 537
Geduld, Proclamations at, 23
Geological Features of East Africa, 214
Geological Society, 45, 499
Geological Society of South Africa, 2, 50
Germany and East Africa, 213
Glasgow and South African Co., 186
Gold, A Bar of, 483
"Gold Fields'" Report, The, 367
Goldfields Rhodesian Properties, 24
Gold Law and the Outside Districts, The, 172
Gold Mining Companies, One of the Earliest, 503
Gold in Natal, 89
Gold Standard, The, 436
Government Reef Again, 460
Griqualand West Loan Trust and Agency Co., Ltd., 236
Group Buying More Freely in Johannesburg, A, 227

Haenertsburg Gold and Copper Co., 285
Haenertsburg Gold and Copper, The Outlook for, 78
Heavy Stocks a Blessing, 297
Henderson's Transvaal Estates, 254

Income Tax on Mining Dividends, 311
Income Tax Relief on Mining Shares, 189
Income Tax on South African Shares, 24
Industrial Fatigue, Question of, 286
Industries and Labour, 335
Industry and Science, 90
Insolvency Law, The New, 436
Insurance Rates, High, 513
Iron Moulders Negotiating, 157
Iron, Steel and Hardware Goods, 135
Iron and Steel Industries After the War, 238
Iron and Steel Position, 473
Iron and Steel Prices, 387
Iron and Steel Trade, 79

Joel-Robinson Deal, The, 562
Johannesburg an Expert Centre, 251
Johannesburg Marking Time, 99
Johannesburg Municipal Electric Power Station," "The, 121
Johannesburg Status, 353
Johannesburg Trades School, 340
Jubilee of the Frieberg Mining Academy, 241

Kimberley (Mashonaland Gold), 412
Knight Central, Ltd., 213
Kynoch Meeting, 167

Labour Agitation, 539
Labour and Industry, 480
Lace Proprietary Meeting, The, 285
Legal Decisions Affecting Mining, 348
Liebig's Rhodesian Ranch, 24
Local Asbestos, 411
Local Foundry Castings, 321
Local Industries Increasing, 377
London Crises Stiffening Trade in Johannesburg, The, 353
Lubricating Oil, Economy in, 186

Machinery for the Cape, 79
Machinery Element dominating Small Factories, 207
Magadi Soda Co., The, 243
Magnesite, 31
Market Report, An Interim, 551
"Marketing Goods," 135
May Consolidated, 339
Mellor's Map of the Rand, Dr., 499
Merchants not inclined to Sell to Speculators, 551
Mercury, A Sharp Rise in, 13
Metal Market and the War, The, 242
Metals Committee, A, 264
Metals: Who Produces the, 162
Metric System and Daylight Saving, The, 350
Mica, 2
Mine Contract Inquiry, 436
Mine Natives and the Governor General's Fund, 117
Mine Purchases and Overstocking, 59
Miners' Phthisis Board, 299
Miners' Phthisis Regulations, 68
Miners' "V.C.": A Notable Presentation, 506
Miners' V.C., The, 499
Mines Buying Machinery and Equipment, 577
Mines and the Engine Drivers and Firemen, The, 3
Mines and the Excess Profits Tax, 2
Mines and Men, 309
Mines Running an Even Keel, 35
Mines Still Buying Timber, 177
Mine Valuation, 1
Mining Lawsuit," "The Great, 436
Mining Lawsuit, The Great Rhodesian, 460
Mining Material and Engineering Trades, 13, 35, 59, 79, 99, 135, 157, 177, 207, 227, 251, 273, 297, 321, 353, 377, 397, 425, 451, 473, 491, 513, 533, 551, 577, 597
"Mining Mathematics," 450
Mining Outlook for 1917, The, 435
Mining Supplies for Rhodesia, 309
Mining Taxation, 576
Mining, The Romance of, 224
Ministry of Science, A, 24
Modder-Clover-Klip Amalgamation, The, 369
"Modder East" Circulars, The, 561
Molybdenum, 480
Molybdenum, Improved Test for, 225
Monteleo Diamonds, Ltd., 435, 500
Morgan's Mining Interests, The late J. P., 46
Moving Picture Industry, 267
Municipality and New Electric Lighting, The, 577
Munition Chemists from South Africa, 214

Natal Mining Law, 119
National Diamonds, Ltd. (in Liquidation), 512
Native Labour Position in Rhodesia, The, 240
Native Recruiting Corporation Annual Meeting, 141
Neumann, The late Sigmund, 49
New Bank, The, 425
New Capital Negotiations, 177
New Industries, 533
New Kleinfontein Dividend Passed, 386
New Modder Finances, 142
New Modder Prospects, 237
New Ophir G.M. Co., Ltd., 459
New S.A. Companies Registered in London, 107
Nigel Activity, 459
Nigel Finance and the Treasury, 436
Nigel Position, The, 45
Nigel, The, 89
Nobel's Explosives: Amalgamation Rumours, 166
Nourse Mines Position, 143
Nuts and Rivets, New Prices for, 491

Oceana Development Co., Ltd., 6, 540
Oil and Colour Trade Improving, 321
Oil and Gas Production," Principals of, 115
Oils Advancing, 227
Oils and Colours New List, 533
Oregon Timber Cable, An, 267
"Outside" Tenders, The Question of, 227
"Outside" Venture, A New, 339
Oversea Timber Trade in 1916, 577

Paper Making, 210
Pegging Case Appeal Fails, 350
Physical Culture for Miners, 521
Physical Culture vs. Miners' Phthisis, 503
Pietersburg Syndicate, Ltd., 463
Piggs Peak, 145
Piggs Peak Prospects, 562
Platkoppie Exploration Co., 117
Platkoppies Syndicate, 562
Pneumonia Research, 389
Post War Finance and Industry, 213
Precious Stones in 1915, 366
Precious Stones Ordinance, 293
Presentation to a Mine Captain, 124
Presidential Address, Mr. Frank Bailey's, 242
Present and Future of Business, 297
Prize Schemes on the Mines, Two New, 310
Pulp Elevation, The Question o" 337
Pulverised Coal for Locomotives, 106

Railway Electrification, 386
Randfontein Extensions, Ltd., 182
Randfontein and Krugersdorp, 480
Rand Klip, Ltd., 384, ii.
Rand Selection Corporation, Ltd., The, 365
Reinforced Concrete in Metallurgical Work, Use of, 284
Retirement of Professor Yates, 500
Rewards for Inventions and Improved Methods, 28
Rhodesia Broken Hill Development Co., Ltd., 562
Rhodesia Chamber of Mines, 118
Rhodesia Chamber of Mines' Report, 215
Rhodesia Munitions and Resources Committee, The, 257
Rhodesian Acting Medical Director's Report, 149
Rhodesian Gold Mining: Excess Profits Tax, 575
Rhodesian Mining Conference, A, 213
Rhodesian Mining Judgment, 376
Rhodesian Mining Timber, 377
Rhodesian Mining Union, 385
Rhodesian Railway Inquiry, 366
Rhodesia and Our Engineering Shops, 451
Rhodesia and Post-War Problems, 536
Rhodesia Small Workers' and Tributors' Association, 50
River Bed Rights, 65
Robinson Group Official Announcements, 411
Rock Drills and Native Labour, 411
Round Table Conference, The, 561
Russian Customs Exemptions for Gold-Producing Machinery, 154

S.A. Jewish Chronicle, 575
S.A. Mining Year Book, 465
S.A. S.M.T. Diplomas, 540

Safety Bulletin Boards on the Rand, 244
Safety Catch Committee, 124
"Safety First" Activity and a Record Accident Rate, 499
Safety-First Medals plus Cash Bonuses, 365
Sakalava, 45
Sands Dumps, 162
Second Hand Goods Dull, 273
Servian Mines, The, 93
Shale Oil Industry, The, 49
Shamva Position, 412
Sheba Gold Mining, 540
Shipping and Insurance Question, The, 551
Shipping of Paramount Importance, 597
Shipping Position, The, 451
Shipping Question, The, 473, 513, 533
Siemens, The Future of, 358
Simmer and Jack—Simmer Deep Deal, The, 483
South African and General Investment and Trust Co., Ltd., 460
South African Society of Civil Engineers, 403
Southern Van Ryn Reef, 394
Special Indicator, A, 207
Springs Mines, 435
Springs Outlook, 385
State Mines, Five New, 499
State Mining Commission, The, 45, 90, 117
State Mining: Views of Industrial Federation, 503
Stock Exchange after the War, The, 224
Stock Exchange Values, 90, 189
Stocks," "Get Plenty of, 451
Strike on Boshock, A, 532
Sub-Nigel Meeting, The, 67
Sulphuric Acid, 339
Sutherland Reef, 161
Swaziland Corporation, 585

Tallow Market, The, 157
Tanganyika-Nile Geology, 45
Tax on Colonial Dividends, 143
"T.C.L." Drilling on Holfontein, 3
Telephone Directory Changes, 2
Telephone or Signal Bells at Mines, 6
Timber, Demand for, 321
Timber and Galvanised Iron, 157
Timber and Local Manufacture, 135
Timber Problem, 353
Timber Quoted "Subject to being in Stock," 597
Timber Trade, The, 425
Tin, Post-Bellum, 456
Tin, The High Price of, 190
Trade Debts of Alien Enemies, 284
Trade and Industry Committee, The, 182
Trade Swing of the Pendulum, The, 273
Trade, The Dullness of, 79
Training of South African Miners, The, 340
Transvaal Mining Statistics, 89
Transvaal Steel, 238
Tungsten, The Manufacture of, 500
Twenty Years Ago, 173, 195, 225, 244, 275, 295, 326, 355

Uitenhage Petroleum and Mining Company, 318
Uitkyk Collieries, Ltd., 436
Underground Contracts, Committee on, 310
Union Finances, 562
U.S. Geological Survey, 562

Vaal River Diggers' Rights, 68
Vaal River Scheme, 95
Van der Merwe, The late Mr., 90
Van Ryn Deep Strike, 479
Van Ryn Estate, The, 561
Victoria Falls Power Co., 161
Vogelstruis Estate, 484

Wakkerstroom Oil Shales, 366
Webb, The late Mr. J. N., 142
Western Rand Brighter Prospects, The, 397
Western Reef, The, 425
West Rand Small Mines, 1
White Lead, Erratic Trading, 79
Wire-Rope Inspection, Canadian Practice in, 284
Witbank Colliery, The Year with the, 287
Wolhuter, 470
Work after the War, 540

Yankee Critic, A, 460

Zaaiplaats Crushing Operations Suspended, 309

ILLUSTRATIONS AND MAPS.

Brakpan Lease Area, 343
Brakpan Lease Sliding Scale, 439

Coaling Appliances.—The Bluff, Durban, New, 151
Coal Shipping Plant at Durban, New, 570, 571
Crown Mines No 14 Circular Shaft, 121

Face of Rich Gravel on the Sandrift Outspan, 565
Far Eastern Rand Area, 199

Government Lease, Modderfontein, 217

Health Campaign, 5

Meyer and Charlton G.M. Co., Ltd., 535
Mill, Springs Mines, 147
Modderfontein Leased Area and Adjacent Claims, 344

New Modder Concrete Foundations for New Mill, 197
New Modder Plant, 195

Orange River at Aliwal North, The, 565
Orange River Diamond Fields, 564

Premier Mine, 393

Randfontein Mines, The, 391
Rooiberg Tin Mine Views, 53

Springs Mines Mill, The, 345
Springs Mines New Construction Work, 167
State Mines Butters Filter Plant.—The largest of its kind on the Rand, 173
State Mines Enlarged Mill, Plate House and Tube Mill House, 169

Van Ryn G.M. Est., Ltd., 535

LEADING ARTICLES.

Accidents in Mines, 119
After the War, 26
Aliwal North Diamond Diggings, The, 563

Barnato-Robinson Deal, The, 387
Board of Imperial Development, A, 240
British vs. German Methods of Finance, 368

Central White Employment Bureau, A, 501
Chemistry and Industry, 70
Coal By-Products Industry for South Africa, A, 163
Coal Economy in South Africa, 191
Coal Industry, The Spurt in the, 16
Coal Trade, The Expansion of the, 541
Commerce and Industries, Wanted: A Minister of, 69
Contract System, The Case for the, 481

De Beers Meeting, The, 342
Decimal System, The, 164
Diamonds, The Improvement in, 4
Diamonds, The Recovery in, 287
Double Income Tax, The Question of, 120

East Rand Government Leases, The, 341
East Rand Problem, The, 25
Enemy Trading, 3
Explosives, A Question of, 144

Far East, A Plea for the, 311
Far East Development.—"A Matter of Urgency," 523
Far East Rand Hold Up, The, 265
Finance of State Mining, The, 501

Geology and Mining, 48
Goldfields Year, The, 413
Gold Mining, Some Effects of War on, 312

Health and the Pay of the Miner, 92

Imperial Department of Mines, An, 192
Imperial Resources and the War Debt, 541
Industrial Development, 47
Industrial Fatigue, 266
Industrial Peace, 312
Industrial Research, 437
Industrial Unrest, 216
Industry and the Cost of Living, The, 587

"Johnnies" Meeting, Rand Questions at the, 288

Labour Lesson from Australia, A, 563
Labour and the Nationalization of Mining, 239
Labour Questions, Sir Lionel Philipps on, 48

Mineral Production and the War, 120
Mine Signboards, 414
Miners' Health and Safety, The, 587
Miners' Phthisis, The Campaign against, 563
Mines and Taxation, 266
Mine Ventilation and the Dust Evil, 143
Mining Parliament, 288

New Modder Progress and Prospects, 311

Oil Shales Investigations, 191

Rand Dividends for 1916, 437
Rand Industrial Questions, 387
Rand Miners' Hours, Wages and Responsibilities, The, 523
Rand Mining Conditions Reviewed, 367
Robinson Group Meetings, The, 481

Soldiers and Employment, Returning, 368
South African Coal By-Products, 4
State Mines, Mr. S. B. Joel and the, 287
State Mines Wanted, More, 461
State Mining Commission, The, 144
State Mining, More about, 215
State Mining, More Views on, 163

Tin Geology, 388
Transvaal Coal Industry, The, 342

Wages on the Mines, 461
White Miners, The Supply of, 91

MONTHLY REPORTS.

Albu Group, 29, 155, 245, 351, 467, 549

Barnato Group, 29, 126, 246, 352, 450, 550
Brakpan Mines, 29, 154, 245, 352, 468, 576

Chamber of Mines' Returns, 1, 459
City and Suburban G.M. and Estate Co., 30, 549
Companhia de Mocambique (Manicaland), 6, 107, 194, 318, 443
Consolidated Gold Fields Group, 30, 155, 245, 351, 467, 549

Diamond Diggings, Cape Province, 503

East Rand Proprietary Mines, 30, 149, 246, 351, 468, 599

Glynn's Lydenburg, 30, 124, 254, 352, 468, 571.
Goerz Group, 30, 155, 245, 351, 467, 549

Lonely Mine, 30, 100, 224, 318, 419, 512
Luipaardsvlei Estate Co., 30, 124, 246, 352, 468

Neumann Group, 29, 155, 245, 352, 467, 550
New Heriot, 155, 246, 468, 599
New Kleinfontein Co., Ltd., 147, 246, 352, 468, 566
Nigel G.M. Co., 245, 468

Rand Mines Group, 29, 155, 245, 351, 467, 549, 583
Rhodesian Mineral Output, 540
Robinson Group, 246, 468
Rooiberg Minerals Development Co., 246

Sheba G.M. Co., 51, 124, 261, 352, 483
Southern Rhodesia, 19
Springs Mines, 468
Stock Exchange Values, 412
S.W. Diamond Fields, 594
S.-W. Transvaal Diamonds, 11, 115
Swaziland Tin Co., Ltd., 6, 122, 224, 337, 450, 524

Tati Company, 224
Transvaal G.M. Estates Co., 29, 155, 246, 352, 468, 576

Zaaiplaats Tin Mine, 49, 147, 254, 370, 460

QUARTERLY REPORTS.

Bantjes, The Position of the 286
Barnato Mines, 291
Barnato Mines, Progress on, 590
Brakpan Mines, 167

Capetown Electricity Department, 337
City Deep, Ltd., 287
Consolidated Langlaagte Mines, Ltd., 291

Consolidated Main Reef, 318
"C.M.S." Subsidiaries, Progress of the, 167, 504
Crown Mines, Ltd., 287

Daggafontein Mines, 167

East Rand Proprietary Mines, Ltd., 340
E.R.P.M. Position, The, 528

Ferreira Deep, Ltd., 19, 286

Geduld Deep, Ltd., 286
Geldenhuis Deep, Ltd., 19, 293
Ginsberg G.M. Co., Ltd., 291
Glencairn, 291
Glynn's Lydenburg, The Position of, 483
Government Areas, 291

Haenertsburg Gold and Copper, Ltd., 386

Knight Central, Ltd., 318
"Knights," 291

Leeuwpoort (African Farms) Tin Mines, 147, 460
Luipaardsvlei Estate and G.M. Co., 32

Main Reef West, Ltd., 318
May Consolidated G.M. Co., Ltd., 290
Meyer and Charlton, 507
Modder B. Report, Latest, 340
Modder Deep Position, 285
Modderfontein B. Gold Mines, Ltd., 19

Nourse Mines, 30
Neumann Mines, Latest Results from, 318
New Goch Gold Mines, 507
New Kleinfontein, 224, 521
New Modderfontein, 30, 340
New Primrose G.M. Co., Ltd., 291
New Unified G.M. Co., 291

Princess Estate, The, 285

Rand Mines Group, 19
Robinson G.M. Co., Ltd., 19
Roodepoort United, 507
Rooiberg Minerals, Ltd., 195, 500

Shamva Mines, 169, 575
Springs Mines, 167
Suh-Nigel Position, 310

"T.C.L." Land Policy, 586
"T.C.L." Mining Activity, 569
Transvaal Chamber of Mines Quarterly Report, 77, 373

Van Ryn Deep, Ltd., 291
Van Ryn Gold Mines Estate, 507
Village Deep Position, 311
Village Main Reef G.M. Co., 257, 469

West Rand Consolidated Mines, 507
Wit Deep, 318
Wolhuter G.M. Co., 147, 197, 392

Zaaiplaats Tin Mining Co., Ltd., 341

SPECIAL ARTICLES.

Afforestation, 31
Annealing Winding Plant Connections, The Value of, 282

Belt Conveyors, Some Suggestions on the Design of, 279
Blasting Gelatine and Gelignite in Rand Hand-Drill Stopes, The Relative Efficiency of, 185
Boksburg Fire-Clays, 50
Brakpan Lease Scheme, The, 343, 439
British Trade Bank, The Proposed, 221
British Trade Mark, £10,000,000, 165

Cam and Motor Mines, 32
Cape Asbestos Industry, The, 94, 127
Clay at Olifantsfontein, 27
Colour Bar on the Transvaal Mines, The, 505
Conglomerates of the Witwatersrand, The, 592
Consolidated Main Reef, Improved Results from the, 148
Cotton Growing in South Africa, 232
Crushing and Grinding Machinery, 20, 38

De Beers' General Manager's Report, 349
Durban Coaling Plant, The New, 569
Durban's New Coaling Plant, The Opening of, 567

East Rand Mining Estates, Prospects of the, 268
Excess Profits Tax, 34

Ferreira Deep Consulting Engineer's and Manager's Report, 464
Future of Rand Short-lived Mining Companies, The, 267

Gold Production, 243
Government Mining Engineer, The Annual Report of the, 93
Government Miners' Training School, 96

How Business and Industry Fight Alcohol, 75

Industrialism, The Coming of, 327
Industrial Research Committee, Recommendations of the, 347

Legal Decisions Affecting Mining, 85

Machinery and Plant in the Union, New, 104
Maize as an Industrial Product, 210
Messina Copper Mines, Impressions of, 484
Mine Mechanics' New Wages and Hours Agreement, 52
Mines and Railways in Rhodesia, 7
Mining in the "Outside Districts," 122, 150
Modderfontein and Brakpan Leases, 544

National Balance Sheet: Annual Stocktaking, The 445
National Physical Laboratory, The, 21
Native Recruiting Corporation Annual Report, 168
New Modder, Another Record Year for the, 123
Nickel Ores in Africa, 370
Nigel, The Future of the, 145

Oil Shale and Coal By-Products, Prospects of the Ermelo District, The, 502
Organisation of Mine Safety and Sanitation, The, 593
Outlook for the Frank Smith Diamonds, 438
Outlook for the Main Reef West, The, 146
"Outside Districts" and the Gold Law, The, 196

Platkoppie Flotation, The, 51
Position of the Johannesburg Consolidated, 73
Position of Premier Diamonds, The, 588
Position and Prospects of Daggafontein Mines, 166
Position and Prospects of the Messina Development Company, 545
Position and Prospects of the Nourse Mines, 125
Position and Prospects of the Sub-Nigel, 72
Position of the Sakalava Proprietary Oil Fields, The, 126
Position of Swaziland Tin, Ltd., The, 28
Position of the Transvaal Gold Mining Estates, 290
Position of the Union Steel Corporation, 543
Position of the Van Ryn Gold Mines Estate, 438
Position of Zaaiplaats Tin, The, 171
Progress of Mining in the Barberton District, 446
Progress of the S.A. Institute of Electrical Engineers, 581
Progress of the "Safety First" Movement, 415
Proposed New Government Mines, The, 217
Prospects of the Ophir Gold Mines, 390
Prospects of the Shamva Mines, 314

Rand as a Future Market for Machinery, The, 129
Rand Miners' Wages and Hours of Work, 529
Re-Organisation of the Gold Fields Rhodesian Development, 443
Rhodesia Chamber of Mines Report, 475
Rhodesian Lime, 33
Rhodesian Mining Conference Results, 315
Rhodesian Mining Conference, The, 292
Rhodesian Molybdenum, Talc and Tantalite, 9
Rhodesian Resources Committee, 153
Rietfontein Series Redivivus, The, 462

S.A. Institution of Engineers: New President's Inaugural Address, 39, 61, 81
S.A. Institution of Engineers Visits B.S.A. Dynamite Factory, 201
Scientific and Industrial Research, 184, 211
Scientific and Industrial Research Imperial, 137
Simmer and Jack—Simmer Deep Deal, The, 525
South African Mining Situation, The, 270
South African Trade: The Incidence of Competition, 57
Standardisation and Its Assistance to the Engineering Industries, 258
State Coal Mines and the S.A.R., 391
State Mines, The History of the, 293
State Mining Commission, Evidence before the, 247
State Mining: Dr. Mellor's Views, 198
State Mining: Some Capetown Views, 394

Tangible Results of the Safety Campaign, 316
"T.C.L." Recent Progress, 242
Time and Labour Saving on the Rand, 471
Tin Concentrates, The Smelting of, 10

Union Tin Mining Progress, 55

Vaal River Bed Case, The, 152
Van Ryn Deep Inquiry, Results of the, 566
Victoria Falls Company, Improved Results of the, 121

Year with the Clydesdale (Transvaal) Collieries, Ltd., 241
Year with the Consolidated Gold Fields, The, 371, 395, 418
Year with De Beers Company, The, 289
Year with the Luipaardsvlei Estate, The, 416
Year with the Rooiberg Tin Mine, The, 53
Year with the Simmer and Jack, The, 71
Year with the Wolhuter Gold Mines, The, 526

Zuurbekom Pumping Station of the Rand Water Board, The, 103

STATISTICS.

Capital in Mining, 91
Claims Held, 524
Companhia de Mocambique, 223

Klerksdorp Gold and Diamond Mining, 485

Mashonaland Railway, 26
May Consolidated Co., 522
Mining Accidents, 522
Mining Statistics, 214

Railway and Harbour Finances, 470
Rand Gold Mining Statistics for 1916, 527

Standard Bank of South Africa, Ltd., 238
Stock Exchange Values, 319

Trade of the Union, 366

Union Customs Statistics, 348
Union Mining Returns, 310, 367, 412
Union's Eight Months' Trade, 162

World's Gold Production, 585

OUTPUTS.

Coal, 90
Copper and Tin, 90

Gold, Manicaland, 572
Gold, Rhodesian, 15, 132, 229, 323, 447, 573
Gold, Transvaal, August, 29, 56; September, 155, 156; October, 237, 245, 271; November, 351, 374; December, 466, 467; January, 549, 583

S.-W. Transvaal Diamonds, 424

Union Mineral Output—Nearly Fifty Million Sterling, 1916; 524

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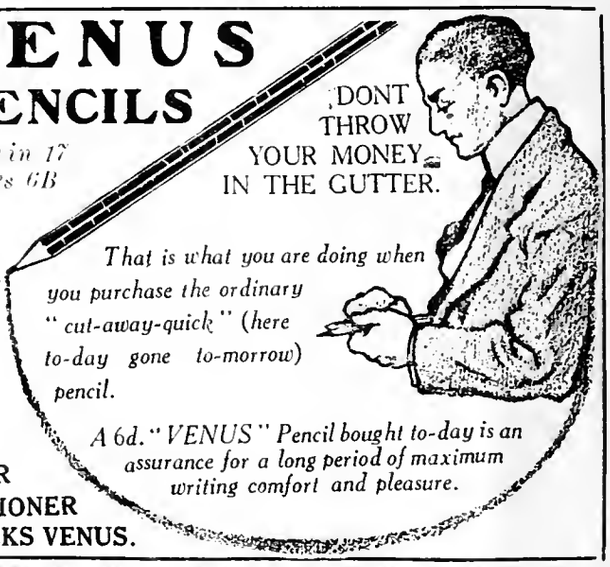

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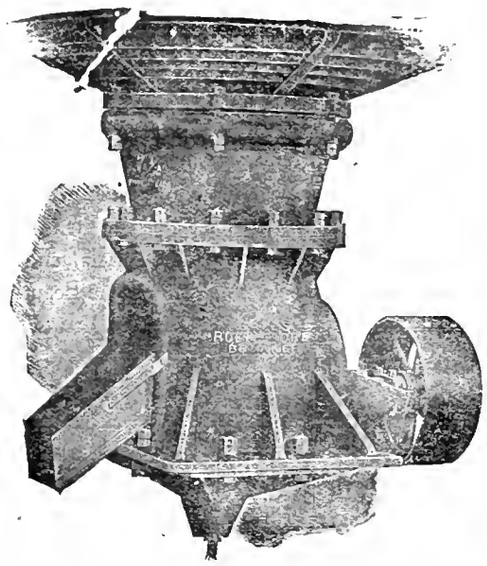

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CONTENTS.

	PAGE
Notes and News	585
Topics of the Week:	
The Miner's Health and Safety	587
The Industry and the Cost of Living	587
The Position of Premier Diamonds	588
The Orange River Diamond Fields—II.	589
Progress on Barnato Mines	590
Transvaal Mining in 1916	591
The Conglomerates of the Witwatersrand	592
The Organization of Mine Safety and Sanitation	593
The Week in the Sharemarket	595
Correspondence and Discussion: " Oceana Development Co."	596
Answers to Correspondents	596
Personal	596
The Week in the Mining Material and Engineering Trades	597
Engineering Notes and News:	
The Wave-Transmission System and it Uses in Drilling	601
Company Meetings: Oceana Development Co., Ltd.	606

Notes and News.

World's Gold Production.

The *Statist*, we notice, estimates the world's gold production last year as £95,725,000, to which British South Africa contributed £44,996,000, Australia £8,842,000, India £2,300,000, Canada £4,050,000, the United States £19,037,000, Russia £6,000,000, Mexico £2,500,000, and other countries £8,000,000. In 1915, it may be recalled, the Transvaal produced £38,627,000 and Rhodesia £3,823,000, making £42,450,000 for British South Africa. Australia produced £9,117,000 in that year. With the exception of Russia, all the other big gold producing countries show decreases for 1916 as compared with 1915. The result is to make the proportion of the Transvaal output to the whole much bigger than for 1915. For that year the world's output was estimated at £96,296,000, the Transvaal contributing just over 40 per cent.

* * * *

Aliwal Diamond Rush.

Several thousand people assembled at Aliwal North diamond diggings last Monday morning, when an area of nearly 400 morgen was thrown open as a public digging. The scene was a picturesque one, hundreds of vehicles being engaged to take the crowd to the farm, where the camp was pitched on the crest of the hill. The proceedings were carried out in a most orderly fashion. Eleven hundred men took part in the rush, which started at the discharge of a gun. There were the usual disputes, but these were all quickly settled by an official of the Mines Department, and soon the inspector's tent was besieged by a crowd seeking licences. Dealing in claims started after lunch, and some good offers were made to holders of tancied claims. Work, too, was started at an early hour, some holders and syndicates having gangs ready to start immediately the claims were proved. There are in all 40,000 claims, and hundreds of applications are still being received for miners' certificates. A law case is expected to result from the pegging of the owner's right of certain claims which are said to be now in the hands of a Rand syndicate, and an interdict is being applied for to stop the discoverer in working the claims.

* * * *

Rhodesian Mining Dividends.

The British South Africa Company forwards the following statement of the dividends declared by Rhodesian mining companies during the year ended 31st December, 1916:—Eileen Alannah, 5 per cent., £19,899; Eldorado Banket, 22½ per cent., £67,500; Gaika Gold, 12½ per cent., £34,187; Globe and Phoenix, 100 per cent., £200,000; Golden Valley, — per cent., £2,100; Lonely Reef Gold, 15 per cent., £40,651; Rezende Mines, 5 per cent., £5,921; Rhodesia Chrome Mines, 50 per cent., £29,837; Selukwe Gold Mining, 6⅝ per cent., £3,732; Shamva Mines, 30 per cent., £180,000; Wanderer (Selukwe), 8½ per cent., £7,500; Wankie Colliery, 12½ per cent., £50,654; total, £641,981. This figure of £641,981 compares with £563,585 declared during the year ended 31st December, 1915, and is the greatest amount declared by Rhodesian mining companies in any one year. The total cash dividends declared by Rhodesian mining companies to 31st December, 1916, amounts to £4,596,087, and this figure does not take into account dividends declared by Rhodesian development and miscellaneous companies in cash or scrip amounting to over £2,400,000, nor dividends paid by local Rhodesian mining companies or syndicates.

* * * *

Swazieland Corporation.

The chief items in the report of the Swazieland Corporation for the twelve months ended September 30 are those contained in the manager's remarks. He says that " on the day our principal lands passed into the hands of the Government we lost the areas which were suitable to company control and development, and became a mining

undertaking. The greater portion of the land we now hold is small-settlement country. The remainder is pastoral land. . . . There is no section of our land which would stand the establishment costs of a big company's operations, though by far the larger portion is rich settleable country, eminently adapted, when cheap methods of transporting produce are available, to the enterprise of the individual settler. . . . We can best utilise our land assets for the prosecution of our mining interests." For this object it will be necessary to provide funds, and the manager gives it as his considered opinion that the company, as a mining venture, will never have found itself in a more encouraging position than it will when a sum of £50,000 is available for further mining work.

* * * *

"T.C.L." Land Policy.

In their report on the company's affairs for the three months ended 31st December, 1916, the "T.C.L." directors state:—Six farms, or portions of farms, have been sold during the quarter, and two sales previously reported have been cancelled owing to the inability of the purchasers to meet their engagements. The sales in the coloured township of New Clare have continued to be satisfactory. Three intervening farms have been purchased adjoining the Rondeboschje group of farms near Potgietersrust, in the Waterberg district, in order to complete the block and make it a workable proposition. It now forms a compact and valuable block of farms. The policy of making building loans to purchasers of land has been continued with satisfactory results. Loans amounting to £3,266 11s. 7d. have been repaid in full. Current mortgages have been reduced by £9,459 5s. 8d. New loans, amounting to £815 8s. 4d., have been made in respect of the company's townships. Allowing for balances due on sales of property during the quarter transferred from property account, and the cancellations of sales above-mentioned, the mortgage bonds and other advances account has also been reduced on balance by £852 8s. Five new leases of farms have been granted, and the leases of two other farms have been renewed. Satisfactory rainfall has been recorded throughout the country, and the cattle on the company's stock farms have continued to do well. Boring operations have been begun on certain of the company's farms in the Northern Transvaal, with a view to providing an adequate water supply for ranching purposes. Progress has been retarded by the heavy rains. The mining results for the quarter are dealt with in another part of this issue.

* * * *

Bwana M'Kubwa Copper.

The report of the Bwana M'Kubwa Copper Mining Company for the year ended 30th June last states that in view of the high price of copper the whole of the plant and the mine workings, which had been shut down since September, 1914, were overhauled during February and March last, and concentrating operations on the high grade ore were resumed in April. From the time concentrating was resumed in April, to the 30th June last, 177 tons concentrates, containing 76 tons copper, were produced, of which concentrates 88 tons were shipped, and realised in this country £3,576 6s. 7d. and the proceeds brought into the accounts at that date. From 30th June last to 31st October 551 tons concentrates were produced, containing about 224 tons of copper, and 137 tons concentrates have been received and realised £6,259 15s. 5d. Recent mining development work indicates every probability that further high grade ore will be opened up. Owing to the shortage of native labour caused by the war, it has not been possible to run the plant at its full capacity. Plans and specifications for a recovery plant with relative power plant to treat per day 100 tons of ore (low grade as well as high grade), and capable of extension to 500 tons per day, have been completed and received by the Board, and have been satisfactorily reported on from the power plant and general engineering point of view by a leading firm of consulting engineers. Estimates of the cost of, and provisional tenders for, such a plant have also been received, from which it is evident that owing to war conditions the cost of such a plant at present and its installation will be much greater than was at first calculated, and considerably beyond the company's actually existing cash resources. The larger shareholders have been approached with a view to a method, satisfactory to the shareholders generally, being propounded for raising the further funds necessary to equip the mine with a recovery and power plant as above referred to, but nothing definite as yet has been arranged.

* * * *

Giant Mines of Rhodesia.

The report of the Giant Mines for the year to June 30 states that the balance brought in was £2,519 and the profit for the past year £18,207, making £20,726, of which £9,914 has to be provided for income tax, based on the profits of the three preceding years, leaving a net available balance of £10,812. Of this, £7,879 has been transferred to reserve account, leaving £2,933 to be carried forward. The directors have allocated £17,879 towards further writing down of certain assets, as shown on the balance sheet, as they consider this course advisable in view of the position at the Giant mine. This leaves the reserve fund standing at £40,000. During the year 80,602 tons were crushed, yielding 12,454·77 ozs. of fine gold, which realised, after deduction of refining charges, £52,617. The working costs for the period were 10s. 0·44d., as compared to 12s. 9·311d. for the previous year. Owing to the condition of the mine, the management state that it is impossible to give any reliable figures of payable ore reserves as at June 30 last. The development work on the Cam-Good Shepherd properties has been satisfactory. The position of the ore reserves as at June 30 last was as follows: Cam-Good Shepherd, 120,531 tons; average value, 44·32s.; gross value, £267,092; Petrol, 10,105 tons; average value, 37·53s.; gross value, £18,961; total, 130,636 tons; average value, 43·10s.; gross value, £286,053. Arrangements have been entered into since June 30 last, under which a certain quantity of the ore from these properties is being treated at the Cam and Motor Co.'s mill, on a royalty basis, from which a revenue is now being received by this company.

* * * *

H.E. Proprietary (New).

The accounts of the H.E. Proprietary for the year to October 31 show that the revenue from dividends and sundry income was £9,852. Provision has been made for writing down such investments as have a market quotation to prices ruling at October 31. Otherwise the investments of the company stand in the balance sheet at the figures of last year's accounts. The total thus written off amounts to £11,196, and after bringing into the accounts general expenses, interest and administration charges in London and South Africa a debit arises on profit and loss account of £5,664, which has been met by transferring that sum from reserve account. The reserve account will now stand at £6,965. The year's work may be summarised as follows: Investments and interests, which at the outbreak of war had reached the profit-earning stage, have continued to yield a satisfactory revenue on the capital invested. On the other hand, where the war found properties in the development stage, and dependent upon further financing, it has been found impossible in most cases, partly owing to the restrictions imposed by the Treasury, to make in England the financial arrangements necessary for their further development. In one instance it has, however, been possible to obtain the co-operation of American capital, and it is hoped that in another concern it will be possible to obtain the funds required from South African sources. Owing to the delays in the South African mail service it is becoming increasingly difficult to complete the accounts for the company's financial year in time for the annual meeting, which must be held before the end of the current month. It is proposed that in future the company's financial year should end at December 31, and the next accounts will therefore cover a period of fourteen months instead of twelve months.

TOPICS OF THE WEEK.

THE MINER'S HEALTH AND SAFETY.

QUESTIONS concerning the miner's health and safety bulked largest in the annual address of the Mine Managers' Association this year. They also monopolised the first debate on mining matters that occurred during the present session of the Assembly. It is true that other mining matters were not ignored at the Mine Managers' meeting. For instance, the fact that the Rand industry should be making records during the second and third years of the war was described as emphasising the work of the Allied Navies. "It was nothing short of wonderful," said the outgoing President, Mr. Brett, "that an essential industry, situated so far from the source of many indispensable supplies should have been able not only to maintain but to increase its activity." The regrettable and seemingly inevitable fluctuations in the native labour force also evoked comment from Mr. Brett; but the evil does not seem, under existing conditions, open to amelioration. The excellent promise of the new and extended scheme of miners' training schools and the deplorable continuance of the migratory habits of the men on the mines were also touched upon, though Mr. Brett hesitated to support the view, recently expressed in these columns, that the latter could only be cured by a central employment bureau. For the rest, his address was devoted to safety and sanitation. Naturally, the establishment of a central examination bureau for miners' phthisis sufferers was welcomed by the Association, since it had long been advocated by that body. Already, as we have seen by the statement made by the Minister of Mines in the Assembly this week, the Bureau has been able to define and limit the disease, and to correct many exaggerated notions commonly held regarding its extent and severity. Mr. Brett mentioned that a system adopted by one of the members of the Association on his mine had now been generally adopted along the Reef, namely, the placing of a book at the shaft head in which every workman was instructed to write down any defects he may have noticed in the water system or other means provided underground for the safety and health of the workmen, and generally any matters that call for the attention of the mine officials. This shows a welcome readiness to adopt "likely" innovations, that gives the lie to certain recent and distant critics of Rand methods. The "Safety First" movement is also one upon the success of which Rand mine managers can heartily congratulate themselves. Mr. Brett's remarks under this head courageously included an important reference to the recognition of the considerable part played by the " boss boys " in any campaign to educate the native worker to the benefits of "Safety First." Apparently there has hitherto been some reluctance to ventilate this question owing to a short-sighted fear of the jealousy of some white employees or their unions. Mr. Brett said:

> " It was a matter that must appeal to them from every point of view possibly more than in any other country, in that here they were responsible for the lives of many labourers who were entirely uneducated and who could not be expected in the majority of cases to realise danger when it was present. Amongst those men themselves a most vigorous campaign must be started with the idea of teaching them how to take care of themselves, and their supervisors must at the same time be taught to realise that the suffering and misery caused through accidents to natives was as real as that caused to white men. With a view to furthering this safety campaign amongst natives it had been suggested by one of the Association's members and recommended by the Association that a system should be started on the mines by which it would be ensured that all boss-boys before being appointed as such should display a fair knowledge of the dangers that were likely to be encountered in a mine and possibly some of the remedies for them. The reason for this was that it had been felt that the only way to get the great body of native labourers to understand these dangers was to have them pointed out and explained to them by members of their own race. As a general measure, it was not felt that much could be done by trying to instruct the mass of the natives through the white workers. He had very great hopes that the general adoption of this scheme would tend largely to decrease accidents amongst the native workmen. The death rate from accidents to whites and natives combined during the year from the figures at present available would appear to be at least as good as that of the previous year, which was a record for the Witwatersrand mines."

It will be noted that Mr. Brett does not anticipate that the 1916 accident rate will break any records, but if the commonsense and too-long-delayed effort to extend to the native underground the lessons of " Safety First " be strenuously taken in hand, we have no doubt that the present year will show a record low accident rate. A sympathetic and satisfactory account of the working of the bureau to find surface employment on the mines for silicotic sufferers brought Mr. Brett's address to a close. Like the speeches of the Minister of Mines and of Mr. Duncan in the Assembly in supporting the motion for a Select Committee to inquire into the working of the Miners' Phthisis Acts, it reflects the now general and genuine anxiety of the Government, of representative public men and of the industry to stamp out the miners' phthisis scourge, and other evils that beset the Rand underground worker, white and black.

THE INDUSTRY AND THE COST OF LIVING.

THE tribute paid by the outgoing President of the Mine Managers' Association to the various committees of the Chamber of Mines for their success in maintaining the supplies essential to the running of the industry finds emphasis in the Blue Book containing the Report of the Commissioner on the cost of living in the Union. Briefly, the Commissioner finds that the increase in the cost of foodstuffs and other necessaries—estimated, on the outcome of enquiries at seven principal towns (Capetown, Port Elizabeth, East London, Bloemfontein, Durban, Johannesburg and Pretoria) at an average of 15 per cent. as compared with 1914—is due to economic causes beyond the control of the agents of production, supply or distribution in the Union. In the majority of instances examined, the Commissioner, Mr. Owen Smith, attributes the rise in selling prices to increase in first cost, and higher importing charges. In recording his opinion that merchants and retailers are not making a profit in excess of that obtained in pre-war days, he points out that what is intended to be conveyed is that present rates of profit are not in excess of those previously ruling when considered on the basis of pre-war and present-day landed costs. " I am quite aware," he says, " that contracts are in existence at favourable prices, and that stocks purchased at pre-war rates are sold on the basis of present-day cost, but this practice is quite usual in commerce: the selling price of an article is usually based on the renewal price, plus the cost of importing, etc. I would, however, emphasise that stocks of provisions are frequently renewed; therefore I do not consider that any undue profit is being obtained to-day on the sale of foodstuffs." Figures are given showing the extent to which the first cost of our total imports has increased since the war, to which must, of course, be added the enormous increase in buying commission, insurance and freight. While expressing the general opinion already stated, the Commissioner, in his finding and recommendations regarding the extent to which the cost of foodstuffs and other necessaries has increased, refers to two specific instances of commodities of colonial manufacture in regard to which, though admitting that an increase in prices was inevitable, he is convinced, he says, that the distributor, and eventually the consumer, is paying more than the circumstances warrant. This he attributes to the absence of competition in the sphere of production. On the question of legislative or administrative action to maintain prices of foodstuffs or other necessaries at a reasonable level, " I am of opinion," affirms the Commissioner, " that South Africa cannot be said to have suffered any material inconvenience or hardship owing to the upheaval caused by this world war; in any case, I believe it would be extremely difficult, if not impossible, to effectively control prices; apart from this, I do not consider the position is such as warrants the taking of drastic measures." He suggests the appointment of a Commission with statutory powers " to enquire into the existence of combines or trusts controlling the prices of commodities, especially those of everyday use; and the extent to which the system of deferred rebates or bonuses exists, and to report if legislation is necessary." The whole subject is bound, of course, to come up for discussion, at a very early date, in the Union Parliament.

THE POSITION OF PREMIER DIAMONDS.

Points from the Annual Report.

THE annual meeting of the Premier (Transvaal) Diamond Mining Company, Ltd., was held yesterday and a full report of the proceedings will appear in our next issue. The general manager's report states that washing operations were resumed on the 11th January, work being confined to the treatment of tailing and cylinder lumps from the No. 1 gear from that date to the 29th July, 1916, when hauling from the mine was commenced. The total number of loads of 16 cubic feet hauled was 1,663,958, accounted for as follows:—Blue ground from 210 ft. level, washed, 119,058; blue ground from 260 ft. level, washed, 222,713; blue ground from 310 ft. level, washed, 363,462; blue ground from 360 ft. level, washed, 119,552; tailings and cylinder lumps, washed, 717,736; stone and reef (discarded), 91,437, making a total of 1,663,958 ft. The total production of diamonds was 419,947 carats; average yield per load, ·267 carat; average cost per load washed, 2s. 4·361d.; average cost per carat, 8s. 10·200d.; average cost per load on total loads hauled, 2s. 2·803d. The average yield per load of mine ground washed was ·179 carat. As the development of the eastern portion of the mine was not as far advanced as other sections, it was deemed advisable on the resumption of mining operations to accelerate this work as far as possible, and a large proportion of the ground since treated has been obtained from this locality. The diamondiferous ground in the area in question has been extensively intermixed with "rubble" and floating reef almost from the surface of the pipe to the present depth, and the fact that it has recently represented one of the main sources of supply on a restricted output a reduction in the average grade was inevitable. The yield above referred to cannot therefore be accepted as the value of the "blue" at the present working levels if operations were being conducted on a larger scale and more generally over the whole mine. The average cost per load washed was 2s. 4·361d. but in view of the unusual nature of the work done during the period under review comparisons with any previous year would be valueless. The above figure includes the cost of constructing the mechanical haulage for conveying the tailings from the No. 1 to the No. 3 washing gear, allowances to employees on active service, as well as the expenditure incurred in making the necessary preparations for re-starting mining and in obtaining the required labour force. On the basis of the present output working costs should not exceed 2s. 6d. per load mined and washed. The whole of the ground treated during the past year has been dealt with by the No. 3 washing gear, the capacity of this plant being equal to present requirements—on the scale laid down by the board. I am pleased to be able to report that satisfactory arrangements have recently been made for the supply of such spare parts as may be necessary for the purpose of effecting repairs and renewals, but which cannot be obtained or manufactured locally. Certain alterations to the No. 4 washing gear are in progress which will improve the efficiency of the plant and tend to reduce maintenance charges when this section of the machinery is again brought into commission. The development of the mine generally, which was well advanced prior to the suspension of operations in August, 1914, has since been further improved by the opening up of additional working faces on the 360 ft. level, and sufficient ground is available above this level to enable the normal rate of production to be maintained for at least three years. Hauling from the present onsetting station can be conveniently continued for another twelve months, affording ample time for the main incline extension and new hauling plant—now in course of erection—to be completed, when hauling from the 360 ft. level can be commenced. The average depth of the mine is 235 ft., the condition of the rim rock is excellent, and there is no reason to doubt that the forecast made in the earlier stages of development regarding the depth to which the present system of open cast mining could be continued will not be fulfilled. Notwithstanding the restricted output, it was considered advisable to proceed with the work of removing the floating reef in the centre of the mine, and it will be observed that 91,437 loads of waste material have been hauled during the past year. Practically all the rock disposed of has been drawn from the southern portion of the "bar," and its removal will greatly facilitate future development operations in that area. The total number of natives admitted to the compound was 9,157, and in this connection recruiting charges amounted to £4,485 14s. 9d., being an average of 9s. 9·5d. per head. Under the company's recruiting organisation special efforts have been directed towards the encouragement of a voluntary labour supply, with increasingly satisfactory results, and during the period under review only 3,382 natives were forwarded under contract by the agents appointed in the various labour districts, the balance, 5,775, having applied for work on their own account. At the close of the financial year 6,500 natives were employed, and no difficulty is anticipated in maintaining this complement. Native wages amounted to £94,880 9s. 10d., being an average of 2s. 9·360d. per native per day, including piecework and overtime, natives, as usual, providing their own food. The death-rate among the natives was equivalent to 13·55 per thousand per annum. The daily average number of white men employed, including apprentices, was 160, and the amount paid in wages represents £43,416 13s. 7d. Employees continue to occupy the company's houses free of rent, in addition to which no charge has been made for water and sanitary services. Capital expenditure to the extent of £1,753 has been incurred, chiefly in connection with the erection of the new hauling plant and in purchasing buildings from employees who had resigned from the company's service.

RESULTS AT A GLANCE.

The following table shows the results of operations since the mine began working:—

Year ended 31st October	No. of Loads Washed.	No. of Carats Found.	Value of Diamonds. £ s. d.
1903	76,931	99,208¼	137,435 2 9
1904	939,265	719,653½	866,030 0 5
1905	1,388,071	845,652	*994,687 5 7
1906	2,988,471	899,746	*1,277,739 6 4
1907	6,538,669	1,889,986¾	†1,702,630 19 8
1908	8,058,844	2,078,825¼	1,536,719 19 0
1909	7,517,793	1,872,136½	1,472,378 7 2
1910	9,331,882	2,145,832¼	1,496,641 5 5
1911	8,325,272	1,574,206	1,433,970 6 9
1912	9,707,098	1,992,174	2,004,943 3 5
1913	10,434,680	2,407,983	2,336,828 15 1
1914	7,683,943	1,417,755	1,259,643 5 11
1915	Mining Operations Suspended.		
1916—			
From mine ground	854,785	153,001½	175,856 4 2
From tailings	717,736	266,945½	

*Includes Cullinan Diamond at nominal valuation. †Proceeds of Cullinan Diamond not included.

Year ended 31st October	Yield per Load. Carats.	Value per Carat. £ s. d.	Value per Load. £ s. d.	Cost of Production per Load Washed s. d.
1903	1.29	1 7 8.5	1 15 6.7	4 7.2
1904	.798	1 3 1.2	0 18 5.3	2 7.62
1905	.609	1 3 6.29	0 14 3.98	3 3.44
1906	.301	1 8 4.82	0 8 6.61	3 5.71
1907	.290	§0 18 0.20	§0 5 2.49	2 4.14
1908	.258	§0 14 9.40	§0 3 9.75	1 10.24
1909	.249	0 12 6.29	0 3 1.43	1 11.42
1910	.230	0 13 11.39	0 3 2.49	2 0.56
1911	.213	0 16 1.97	0 3 5.34	2 2.02
1912	.205	1 0 1.50	0 4 1.57	2 4.79
1913	.202	1 2 2.05	0 4 5.74	2 6.67
1914	.185	0 17 9.23	0 3 3.34	2 5.89
1915	—	—	—	—
1916	.267	1 2 7.95	0 6 0.63	2 7.62

§Subject to the loss on Contract with Diamond Syndicate.

THE ORANGE RIVER DIAMOND FIELDS.—II.

[By P. A. Wagner.]

The Orange River Diamonds.

Up to the present the Orange River Fields have produced diamonds to the value of about £11,500. The largest stone so far found weighed 63 carats and was sold for £365. It was picked up on the farm Poortje, in the patch of gravel in which the original discovery was made. The best stone hitherto recovered was found on the Sanddrift Outspan. It weighed 22 carats and realised £516. Another 27¼-carat stone from the same locality was sold for £500. The diamonds appear to become smaller as one proceeds downstream, but the evidence on this point can at present hardly be said to be quite conclusive. The average size and value of the stones are said by buyers to be much the same as on the Vaal River fields. As regards crystallisation, stones of octahedral and dodecahedral habit predominate; the faces of the dodecahedra being frequently ridged in the direction of the shorter diagonal which makes them approximate in shape to tetrahexahedra. Flattened heart-shaped crystals and "maacles" are also very common.

Compared with the product of the alluvial deposits in the basin of the Vaal, the Orange River parcels are characterised by the preponderance of yellow and brown diamonds, by the presence of peculiar "oily" or opalescent stones, closely resembling those found in the Premier Mine, and by the almost complete absence of "cleavage," though broken crystals are by no means uncommon. Blue-white diamonds appear to be rather rare; "fine-whites," on the other hand, are very much in evidence. Many of the stones are spotted. Bort is rare. The character of the diamonds appears to be much the same throughout the diggings. In a parcel from Kortkom, however, the writer noticed two stones differing in their crystalline form from any that he saw from the deposits in the neighbourhood of Aliwal North. One of these was a small white octahedron with sharp-edged terraced faces, closely resembling some of the octhedra found in the Jagersfontein mine, the other a peculiar rough-looking cubical crystal, of a type very unusual in South Africa but of fairly common occurrence in the alluvial deposits of Brazil. Some experts maintain that there is a fairly close resemblance between the Orange River diamonds and the better class of Premier "goods," but the writer must confess that apart from the "oily" stones, already referred to, he did not see any great similarity.

The Origin of the Diamonds.

The problem of the origin of the Orange River diamonds while similar to that of the origin of the stones found in the basin of the Vaal, is on the whole far more simple. For while a certain proportion of the Vaal River stones may possibly have been derived from the denudation of the ancient pre-Karroo rocks exposed in Griqualand West and the South-Western Transvaal, the whole of the upper portion of the Orange River basin is occupied by rocks belonging to the Karroo system. It is quite evident therefore that the Orange River diamonds must have been derived either from the Karroo beds themselves or from igneous rocks intrusive in them. Professor Schwarz, of Grahamstown, recently claimed to have found small diamonds in the so-called "felspar bed" of the Molteno sandstones, and as this stratum must originally have been present over the whole of the area, with which we are dealing, some of the Orange River diamonds may conceivably have been derived from it. The invariable presence in the diamond-bearing gravel of grains of "mine carbon" (ilmenite) and "mine" garnet (pyrope) suggests, however, that the bulk of the stones have been derived from the denudation of one or more occurrences of kimberlite—either pipes or dykes. A dyke of kimberlite was recently opened up on the farm Boschberg, No. 60, and there is another on Ackermann's Kraal. They are, however, both barren, and therefore of no interest from our point of view. Grains of garnet and ilmenite occur in the river bed on the farm Geneva, about five miles above Aliwal North, and garnets are associated with the diamonds found on Zonnebloem. The source of some at any rate of the Orange River diamonds would thus appear to lie well above Zonnebloem; and if the story of the alleged finding of three diamonds near the western boundary of the Herschel district be correct also above that. Now both the Herschel district and Basutoland are closed to prospectors, and unless, therefore, the pipe or dyke of kimberlite is situated on the Free State side of the river between the western boundary of the Herschel district and the Basutoland border, there is no likelihood of its being discovered in the near future.

The question next arises whether a primary occurrence situated farther down-stream may not have contributed a portion of the diamonds. The circumstance that grains of garnet and ilmenite were fairly common in the patch of gravel in which the first diamond was found on Poortje and in a somewhat similar occurrence, situated to the south-east of this and to which reference will presently be made, has led to the belief that there is a pipe on the farm. As a matter of fact, however, these minerals appear to have been confined to the heavy, concentrated pay-wash, and the well-rounded and worn character of most of the grains that the writer saw suggests, moreover, that they have travelled a considerable distance.*

At Kortkom garnets and ilmenite are more abundant than anywhere else on the diggings, and, as already pointed out, certain of the diamonds from this locality differ from those found higher up the river. It is possible, therefore, that there may be an undiscovered occurrence of diamond-bearing kimberlite in the neighbourhood of the farm. In this connection, sight must not, however, be lost of the fact that Kortkom is situated well below the inflow of the Caledon River, which brings down considerable quantities of "deposit" from the pipes in the south-eastern portion of the Orange Free State and also possibly diamonds. The evidence is thus far from being conclusive, and, in any case, there is nothing to indicate the whereabouts of the pipe if it does exist. While it is possible, therefore, that in addition to the primary occurrence which, for reasons already given, must be assumed to exist above Zonnebloem, there may be another in the Orange River basin, farther down-stream, the chances of discovering either af them appear to be remote.

Description of the Localities and Deposits in which Diamonds have so far been Found.

In what follows a brief account will be given of the localities and deposits in which diamonds have so far been found, beginning with the farm Poortje on the north bank of the Orange opposite Aliwal North.

Poortje.—On this farm the river is bordered by seven distinct terraces, which rise like a series of great steps to a height of 250 feet above the present level of the stream. It was in a small patch of gravel on the third of these terraces that the original find was made. The terrace is situated about 550 yards to the north of the river and about 75 feet above it. The bed-rock is purple Burghersdorp shale. On opening up the deposit, it was found to consist of a basal layer of coarse river-wash, overlain successively by a thin bed of dark-coloured fine gravel, very rich in "bantams," and an upper layer of coarse gravel. Altogether 128 diamonds, including one of 63 carats, were found in this patch, the majority coming from the "bantam" layer. Prior to the finding of the first stone a good deal of the gravel had been used in the construction of a railway embankment, and it is practically certain therefore that this contains diamonds. As the owner of Poortje was, however, compensated in full for the material thus employed it is very doubtful whether the embankment will ever be disturbed.

Another patch of diamond-bearing gravel was struck some little distance to the south-west of the one just described, by the Poortje Prospecting Syndicate, in an ancient channel of the Orange, situated at a slightly lower level. The pay-wash, which formed a lenticular layer,

* Some of the so-called "burnt" garnets found at Poortje and other localities along the river, have sharply angular outlines. This is probably due to the fact that this type of garnet is generally traversed by numerous fine cracks, and, in consequence, very brittle.

varying in thickness from a few inches to five feet, is surrounded on all sides by barren gravel. It was characterised by being rather coarse, by having a calcareous cement and by containing numerous "bantams." In all 35 diamonds of an aggregate weight of 51½ carats were found in this patch. The largest stone weighed 10 carats and is said to have realised £20 per carat, which is certainly more than it is worth. The Poortje Prospecting Syndicate, which has since suspended operations, also carried out a fair amount of exploratory work on the gravels on the so-called Poortje Draai, opposite Ackermann's Kraal. Here there is a fairly extensive deposit of gravel on a terrace about 80 feet above the river, and another in the present stream bed. The terrace gravels are up to 8 feet in thickness but apparently barren of diamonds, and the same applies to the wash in the river bed.

Aliwal North Commonage.—On the Aliwal side of the river a ¾-carat stone was found some time ago about 100 yards below the Frere Bridge, in a lenticular deposit of gravel reposing on a platform of sandstone at an elevation of about 20 feet above the level of the river. A good deal of work was subsequently done at this spot without any further finds being made, and the same digger is now working on a somewhat similar deposit of gravel immediately above the bridge. Digging operations are also in progress about 500 yards above, and 700 yards below, the bridge. At all three points the gravel, which does not look very promising, is covered by a heavy overburden, and it appears highly improbable that it will repay exploitation. There are extensive deposits of high-level gravel on the Aliwal commonage some distance to the east of the village. These have received a good deal of attention from local diggers, but as yet have not yielded a single diamond.

Zonnebloem.—On the farm Zonnebloem which, as already stated, is situated on the south bank of the Orange about 10 miles above Aliwal North, eight diamonds have been found in a deposit of gravel on a high-level terrace, fully a mile from the river. The diamond-bearing wash occurs beneath a layer of barren gravel.

(*To be continued.*)

PROGRESS ON BARNATO MINES.

Points from Latest Quarterly Reports—State Mines Profits and Ore Reserves Increased—Van Ryn Deep's Improved Profits—Working Costs Higher All Round.

THE features of the returns from Barnato mines for the three months ended December 31, 1916, are as follows:—

At the Consolidated Langlaagte, the quantity of ore milled was less by 4,750 tons than that crushed during the previous quarter. There was an improvement in the grade, and the recovery value was 9d. per ton higher. Working costs increased by 5d. per ton, and the gross profit was £294 above that for the preceding three months. The east incline shaft was sunk 60 feet to a total depth of 4,057 feet. The South Reef continues to be exposed in the shaft, and gave an average value of 9.3 dwts. over 41 inches. The west incline shaft was sunk 21 feet to a total depth of 3,507 feet. The development footage sampled totalled 4,030 feet, and gave the following results: Payable, 1,858 feet, having an average value of 23.64 dwts. over 17 inches of reef. Unpayable, 2,172 feet, having an average value of 6.11 dwts. over 14 inches.

At the State Mines a portion of the additional reduction plant was in operation throughout the quarter, with the result that the tonnage milled showed an increase of 63,100 tons as compared with the preceding three months. Working costs were .229 of a shilling per ton higher, but there was an improvement in the grade of 11d. per ton, and the gross profit was increased by £31,266. The development footage sampled totalled 3,180 feet, and gave the following results: Payable, 2,410 feet, having an average value of 13.1 dwts. over 52 inches of reef. Reef partly exposed, 160 feet, having an average value of 4.2 dwts. over 31 inches. Unpayable, 610 feet, having an average value of 3.9 dwts. over 45 inches. During the months of November and December considerable difficulty was experienced in the working of the mine owing to the unfortunate breakdown of the large electrical compressor. This unit represents about a third of the total air compressor plant on the mine, and during the time it was out of commission, the underground work generally was disorganised, and a large amount of the development had to be suspended. The payable ore reserves were increased during the quarter by over 88,000 stoping tons.

At the Van Ryn Deep, there was an increase of 3,650 tons in the quantity of ore milled as compared with the previous quarter. Working costs were about 5d. per ton, and the recovery value about 6d. per ton higher, and the gross profit showed an increase of £1,933. The west incline shaft was sunk 31 feet to a total depth of 1,468 feet, and has now reached its ultimate depth. The development footage sampled totalled 1,884 feet, and gave the following results: Payable 1,483 feet, having an average value of 29.5 dwts. over 15 inches of reef. Unpayable, 401 feet, having an average value of 9.3 dwts. over 16 inches.

At the Knights, there was a decrease of 6,510 tons in the quantity of ore crushed as compared with the previous quarter. Working costs were 8d. per ton higher, and, although there was a slight increase in the grade, the gross profit was reduced by £5,901. The southern incline shaft was sunk 216 feet to a total distance of 2,566 feet. The development footage sampled totalled 1,160 feet, and gave the following results: Payable, 750 feet, having an average value of 11.8 dwts. over 37 inches of reef. Unpayable, 410 feet, having an average value of 3.7 dwts. over 39 inches.

At the New Unified the quantity of ore milled was 1,000 tons less than that for the previous quarter. Working costs were about fourpence per ton higher, but the grade improved to the extent of fivepence per ton, and the profit from treatment of accumulated slime also showed an increase, so that the gross profit was £178 above that for the preceding three months. The development footage sampled totalled 140 feet, and gave the following results:—Payable, 65 feet, having an average value of 26.5 dwts. over 15 inches of reef. Unpayable, 75 feet, having an average value of 10.4 dwts. over 11 inches.

At the Glencairn, the tonnage crushed was reduced by 2,100 tons as compared with the previous quarter. Working costs were slightly higher, and the recovery value of the ore milled was 3d. per ton less. As against this, there was an increase of £300 in the profit from treatment of accumulated slime, and the gross profit was £733 below that for the preceding three months. Of the total ore mined, 62,702 tons were obtained from reclamation and other sources, and the ascertained ore reserves were depleted by 7,570 stoping tons.

At the Ginsberg, there was an increase of 354 tons in the quantity of ore crushed as compared with the previous quarter. Working costs were about 8d. per ton higher, and the recovery value of the ore milled was lower by 10d. per ton. As a result, the gross profit was reduced by £3,367. The development footage sampled totalled 187 feet, and gave the following results: Payable, 60 feet, having an average value of 11.8 dwts. over 26 inches of reef. Unpayable, 127 feet, having an average value of 4.9 dwts. over 23 ins.

At the New Primrose, the quantity of ore milled was 2,800 tons less than that for the previous quarter. There was a slight increase in the grade, and the working costs per ton and the gross profit were practically unchanged. The development footage sampled totalled 510 feet, and gave the following results: Payable, 270 feet, having an average value of 16.8 dwts. over 22 inches of reef. Unpayable, 240 feet, having an average value of 8.2 dwts. over 11 inches.

TRANSVAAL MINING IN 1916.

[By H. F. Marriott, Consulting Engineer, Central Mining and Investment Corporation, Ltd., London.]

The following extracts are from the annual review of Transvaal mining, contributed to the *Engineering and Mining Journal* of New York by Mr. H. F. Marriott:—In spite of the increasingly difficult conditions caused by the war, the gold production of the Transvaal has made considerable progress throughout the year and the output bids fair to be the largest on record. The steady increase is no doubt partly due to the satisfactory maintenance of the labour force, and also to the fact that the immense importance of the industry at the present time has been realised by all concerned and no effort has been spared to keep the production at the highest possible level. On September 30 there were 51 producing companies on the Rand. The running of the mines suffered various disabilities owing to the war. A large number of the employees were away on active service, and the payments made to them and their dependents constituted an additional charge on working expenses. The cost of materials and stores was greater, bonuses were granted on account of the higher cost of living, and gold realization charges were increased. In the Nigel district the Sub Nigel developed additional high-grade ore reserves and considerably increased its profits. On the other hand, its immediate neighbour, the Nigel Gold Mining Co., after a long and successful career, has had to close down. Milling at the Jupiter mine, which ceased in 1913 and was resumed in September, 1915, has continued with moderately successful results, and the company has reappeared in the list of dividend payers. In September the west mill of the Nourse mines was closed down and work was concentrated on the Deep mill, the capacity of which was increased to 50,000 tons per month. The New Goch, which reappeared in the list of dividend payers in 1915, has made a working agreement with the City Deep with regard to the mineral rights over 21 claims. This will enable the mine to continue for another four years. The capacity of the City Deep plant is being raised from 65,000 tons to 80,000 tons a month by the addition of a Butters slimes plant. The site of the new vertical shaft on the Booysens Estate, Ltd., which property is now part of the Robinson Deep Gold Mining Co., was selected early in the year, and sinking is now in progress. The Crown Mines new deep-level shaft, which is expected to cut the reef eventually at a depth of 4,500 ft., created a world's record for circular-shaft sinking by advancing a distance of 246 ft. in the month of September. Including the next day following, in order to obtain a result for a 31-day month, the total footage accomplished was 252 ft. The previous record for the Rand was for a rectangular shaft in the Government Gold Mining Areas (Modderfontein), which was sunk 233 ft. in 31 days. The West Rand Central mine is now worked out, and operations ceased in July. During the last year the Far Eastern Rand has been the subject of the keenest interest and discussion. Nine companies were producing in 1916, eight of which paid dividends. The ore crushed was at the rate of 4,700,000 tons per year, and preparations are nearly completed to increase this output to 5,500,000 tons per year. The terms of agreement between the Daggafontein Gold Mining Co. and the Consolidated Mines Selection were finally settled in January. The latter undertook to subscribe £300,000 working capital, and a further £500,000 will be found on the exercise of options on shares. The Central Mining, Henderson's Transvaal Estates and Barnato Bros. are participants. Some of the extensions of plant decided upon in 1915 were carried out. The erection of the additional reduction plant of the New Modderfontein Gold Mining Co., which with the existing plant will enable the company to treat about 1,100,000 tons a year, was delayed owing to difficulty in obtaining the material ordered. The value of the total increased production is estimated at £80,000 per month. The Government Gold Mining Areas (Modderfontein) doubled its plant by the addition of 100 stamps, which began working in October. The Geduld Proprietary Mines, Ltd., is also extending its plant so as to increase its capacity from 24,000 to 40,000 tons a month. It is stated, however, that the full benefit of the extension will not be felt for some time, owing to the fact that the old plant needs considerable repair. The mill of the Modderfontein Deep Levels was increased by an addition of 10 stamps, which began working early in June. This increased the monthly capacity of the mill to 40,000 tons. The question of the further exploitation of the Far Eastern Rand aroused great interest during the year. In February the matter was under debate in the Legislative Assembly. The immediate result of this debate was that R. N. Kotzé, the Government Mining Engineer, was commissioned to report on the subject. His report was issued in May. Mr. Kotzé estimated that the unexploited area amounted to 74,000 claims, containing reef at a depth of less than 5,000 ft. vertical, and further that if only half of this area proved payable, it would yield gold to the value of approximately £450,000,000. He suggested that in the event of the exploitation of the new ground by private companies the Government's share of the profits should be on a sliding scale based on actual profits. He pointed out that immediate steps should be taken to open up and work this district with the object of maintaining the present rate of gold production. The arrangements made at the beginning of the war, for realising the gold produced and obtaining supplies, continued during the year under review. Cyanide, three-quarters of which came from Germany before the war, was during 1916 obtained almost entirely from the Cassel Cyanide Co., of Glasgow, and the British Cyanide Co. The mining industry has been equally fortunate as regards explosives. The South African factory owned by the De Beers Company has continued its supply to the mines at practically pre-war prices in contradistinction to the increased rates ruling in other mining centres. In 1915 a special war levy was imposed on "the profits of mining for gold," which amounted to £500,000. In 1916 this tax was levied again. The Vaal River water-supply scheme, sanctioned by the Government in 1914, was not proceeded with in 1915, as it was not considered advisable to carry on this work at the time. Since then a modified scheme has been considered, and in February, 1916, the Rand Water Board decided that the barrage to be erected at Vereeniging should be of the same size as that originally designed and should store the same quantity of water, but that only 5,000,000 gallons should be supplied per day instead of 10,000,000. The estimated cost of this scheme was £758,000, as against £1,250,000 for the original scheme, the difference being due to reduced pumping plant and distribution system. It was estimated that the Rand Water Board's redemption fund would be sufficient to meet the cost of the work for two years. At the end of that time a further loan will be required. The decision in favour of this scheme was given by the Water Court in May, and the work was begun in September. It is estimated that the scheme can be completed and the water be available in three years from the date of the commencement of the construction work.

Diamonds and Base Metals.

The policy of restricted production of diamonds since the beginning of the war was continued to the end of last year. Since then most of the mines, after being closed for 17 months, have been working on a small but increasing scale. The number of natives employed on the diamond mines in January was 802. This figure had increased in September to 6,527. The product has been sold at rising prices, and dividend payments by the companies have been resumed. The Messina Copper Co. declared its first dividend in May, at the rate of 20 per cent., absorbing £36,357. In spite of the exceptional dryness of the season, the tin-mining industry made good progress and the output remained up to the normal standard. In order to increase the life of the mine, early in the year the Zaaiplaats Tin Mining Co. acquired from the Transvaal Consolidated Land and Exploration Co., a base-metal lease of 120 claims adjoining the companies' property.

THE CONGLOMERATES OF THE WITWATERSRAND.*

Dr. E. T. Mellor's Reply to the Discussion on His Recent Paper.

Dr. E. T. Mellor's reply to the discussion on his recent paper is as follows: With regard to the mode of deposition of the conglomerates, Dr. J. W. Evans prefers to the deltaic explanation one involving conditions similar to those prevailing in the northern plains of India, with "sheet floods" bringing down great deposits of pebbles from the mountains all along the range. My attention has also been drawn to similarities existing between the Rand conglomerates and those which cover extensive areas in Persia and Sistan. Objections which might be urged against both these suggestions are that the conditions associated with deposits in deltaic or similar areas are much more widely prevalent to-day, and are perhaps likely to have occurred more frequently in the past than those which have been suggested as alternatives, and, further, that many features of the Witwatersrand system besides the conglomerates appear to be more easily accounted for on the deltaic idea. Comparison, however, with the other modes of deposition is difficult, from the fact that when one comes down to details or to actual measurements of thickness, extent and so on, it is not easy to obtain adequate information, a difficulty which applies almost as much to deltas as to the other forms of deposit. If either of the suggested modes of deposition were applicable one might expect the conglomerate sheets to be associated with deposits of which some at least were of a terrestrial character, which, as far as my knowledge of them goes, is not the case. It would be extremely interesting if one could have an opportunity of making a close comparison with the deposits in question. Mr. Foster Bain draws attention to a fact which has often struck me just as forcibly, and that is that a large proportion of mining men have a decided preference for attributing ore deposition to igneous agencies, just as they frequently ascribe the most extensive powers of disturbance to dykes, whose occupation of their present situations was probably in many cases of a most placid nature. Mr. S. J. Speak misrepresents me when he says that I will not allow my imagination to persuade my mind that gold could have infiltered into an extensive bed. I am quite able to imagine such a process. What, however, I cannot do in face of such abundant evidence as we now possess, is to persuade myself that gold so introduced should, in its mode of distribution and in many other respects, show so close a relationship to the sedimentary features of the beds in which it is found. A coincidence or two I can accept, but not a whole suite of coincidences. I certainly do not think the supposition put forward by Mr. Speak beyond the possible limits of imagination, but consider that most of us will be disinclined to make such a supposition when a much simpler and more natural explanation will suffice. Professor C. G. Cullis draws attention to the fact that iridosmine is frequently associated with alluvial gold, and the presence in the Rand conglomerates of water-worn iridosmine, diamonds and other materials which might be expected to accompany detrital gold will be regarded by many as very suggestive evidence in favour of a placer origin for all these constituents. The attractiveness of the idea that the conglomerate beds had served as channels for the passage of solutions from some deep-seated source towards the surface is no doubt largely responsible for the origin of the infiltration theory. Most of those who favour this idea probably think of the conglomerates, before serving as channels as having been folded and denuded so that their outcrops would form the outlets which would appear to be necessary to allow of a passage of mineral solutions through the conglomerates. If such a folding had taken place before the infiltration of the gold one might reasonably expect as suggested by Dr. Cullis, that highly inclined portions of the beds might show a more copious mineralisation than those which had probably always remained more or less horizontal. This point early engaged my attention and I have always been on the look-out for evidences of such preference. So far, however, I have never been able to trace any connection between the disposition of particular portions of the conglomerate beds and their degree of mineralisation. Mr. L. H. Cooke's suggestion, made in discussing Professor Gregory's paper on the Rand Banket, that the persistent conglomerates of the Rand originated by the concentration of pebbly sands, may possibly apply to some of the more persistent bands in such groups of conglomerates as the Bird and Kimberley Reefs, but is, I think, hardly applicable to beds in the Main Reef Group like the Main Reef Leader, nor the similar examples which occur in the lower division of the system, such as the Government Reef. The position of the Main Reef Leader on the East Rand and of the Government Reef over a larger area, which both lie directly upon a considerable succession of shaly beds, would be difficult to explain on Mr. Cooke's suggestion. It must be noted that the foot of the conglomerate bed in each of these cases is a definite and continuous parting plane, extending over hundreds of square miles. If such a sheet as the Main Reef Leader had been concentrated from a succession of pebbly sands as suggested, then we might expect that in places between the reef and the shale foot, remnants of the original pebbly deposits might remain. This is, however, not the case as far as is known, and our knowledge is pretty extensive. To my mind the features of such beds of conglomerate as those mentioned suggest definite incursions of pebbles into new areas of deposit. With regard to the questions raised by Mr. E. P. Rathbone with respect to original gold in the pebbles and in the nuggets, what appeared to be an undoubted occurrence of the former was exhibited by Mr. Weston on the occasion of the reading of my paper before the meeting of the Chemical, Metallurgical and Mining Society of South Africa, in Johannesburg, in February last, and has been referred to in the local discussion. The nature of the "nuggets" frequently mentioned in connection with the Rand bankets has been referred to in my paper. The absence of any undoubted nuggets does not seem remarkable when we consider that the original detrital gold must necessarily have been for the most part very fine in grain, as is the case in many placer deposits of to-day. Mr. Rathbone speaks of the "absolutely even distribution" of the gold, and comments on the absence of "pay streaks." The gold, however, can only be spoken of as evenly distributed in a very general way when the whole extent of the gold field is taken into consideration, and when a comparison is drawn with the much greater variations in the distribution of values shown by nearly all lode deposits. It would be easy to quote many pairs of adjacent mines whose respective managers would scarcely agree that their mines had been equally treated by Fortune in the matter of gold distribution, and within the limits of single mines it would be equally easy to indicate areas showing as great a divergence in gold contents as have been found in many alluvial fields, as for example those of Nome. Typical examples also of "pay streaks" are plentiful, especially in connection with the Main Reef Leader and the South Reef, and these are frequently related to a special underlying layer of originally clayey or very fine-grained sandy material as in modern placer deposits. It is the manner in which inquiry into such special features in the distribution of the gold shows them to be almost universally related to corresponding features in the conglomerates themselves or in the accompanying beds, that continually adds to the evidence in favour of the placer origin of the gold, and when as much prominence has been given to the evidence in this direction as has been enjoyed in the past by arguments in favour of the infiltration theory it is unlikely that the conclusion arrived at will be that the truth lies somehow between the two, as Mr. Rathbone suggests. To the question as to whether the isolated bodies of conglomerate enclosed in the Black Bar or the Bastard contained gold an affirmative answer can certainly be given, and it is noteworthy that the gold content is of the same order as that characteristic of the Main Reef in the same locality.

As pointed out in my paper and emphasised by Mr. Vivian, the absence of nuggets and the generally fine character of the gold in the conglomerates is only what might be expected from its mode of deposition. To Mr. Vivian's comparison with the prolonged action of a tube-mill must be added the early settling down of the coarser detrital gold in areas probably north of the present extent of conglomerates. In this connection it is worthy of note that whereas fairly coarse "visible" gold is of common occurrence in mines along the northern margin of the Far East Rand, like Van Ryn and Modderfontein, "visible" gold is rarely seen in mines in the Nigel neighbourhood on the southern side of the basin, even on very rich specimens of reef, and that the increasing fineness of the gold on the south as compared with the north corresponds closely with the diminution in the average and in the maximum size of the pebbles in the same direction. With regard to Mr. Vivian's difficulty as to the direction of flow arising from my use of the terms base and apex, it should be explained that base was used for what I consider to have formed the thicker and probably broader northern portion of the deposit, and apex for its thinner southern portion which lay furthest from the source of the material. Mr. Mennell, in attributing to my paper a professorial as contrasted with a practical man's standpoint, says that "Mining engineers would ask themselves the question: Where do we see any alluvial deposits which have any similarity whatever to those which we find on the Rand?" Apparently the answer to this question has not been difficult to find, for it is a notable fact that it is precisely among practical mining engineers on the Rand, many of whom by previous American experience are well acquainted with some of the largest placer deposits in the world, that the placer origin of the Rand gold has long found the widest and least hesitating acceptance. Dr. Henderson's point with regard to the patchy distribution of the gold was, I think, dealt with in my paper. In the Far East Rand such a mode of distribution is particularly evident, and in the Central Rand is frequently clearly shown when each of the "reefs" there mined is viewed separately. When this is not done the results obtained from any single "reef" such as the Leader are masked by those due to an entirely different body of conglomerate, such as the Main Reef, which may be mined with it. It would be interesting to have fuller accounts of placer deposits, such as were briefly referred to by Mr. Purrington. Information with regard to such occurrences is not very complete or abundant as compared with the records of other classes of deposits. Perhaps this is partly due to the fact that the structural arrangements of placer deposits were frequently obliterated in the process of exploitation, whereas, in other mineral occurrences the more extensive the working the more the arrangement and character of the deposit became available for study.

(To be continued.)

*From the Bulletin of the I. of M. and M.

MINING EXAMINATIONS.

Study for Certificates as Mine Captains, Mine Managers, Surveyors, Mechanical and Electrical Engineers, and Engine Drivers. Private Tuition and Correspondence Lessons, where personal tuition is impracticable. Practical Mathematics and Electrotechnics. E. J. MOYNIHAN, Consulting Engineer, Cuthbert's Buildings, corner of Eloff and Pritchard Streets, Johannesburg, P.O. Box 2061.

THE ORGANIZATION OF MINE SAFETY AND SANITATION.

Being a Classified Synopsis of the Data Collected by the Committee on Safety and Sanitation of the A.I. of M.E.

The following report has been issued by the A.I.M.E. Committee on Safety and Sanitation:—There are few operating companies which have not started a more or less systematic campaign to safeguard their employees from accidental injuries and unhealthful surroundings, but a great deal is to be gained by experience. All may welcome the advice and co-operation of those who have been actively engaged in the work and have demonstrated the results obtainable by organized effort, and it is, therefore, exceedingly gratifying to note the ready assistance and hearty co-operation rendered by the companies that may be truly termed pioneers in the movement. No solution of the safety problem is to be found in a strict standardization of methods, rules or devices, as the various mining, milling and metallurgical practices present too many conditions differing broadly in general principles, but some standard system embodying principles already proven to be efficient should be created, which may be modified or elaborated to meet specific requirements of each individual company, or to fit working conditions as they exist in the various mining camps throughout the country. An industrial plant is primarily a business undertaking, therefore the economic side of a safety or welfare campaign is of importance. Many small operators have been deterred from undertaking the work by their belief that it involved an expense beyond their means, and one that could not be counterbalanced by greater efficiency or saving along other lines. This idea is generally due to a lack of knowledge of the actual costs of such work, and of the results secured by judicious selection of a method commensurate with the size and nature of the operation. The widespread adoption of safety measures by both large and small operators is conclusive argument in favour of economic results. The cost need not be great, and should be, in a measure, proportional to the pay-roll. There are many ways in which a company will benefit both directly and indirectly by the work. The efficiency of the men is increased by their working under conditions where there is little danger of accident. Safety work with the proper enforcement of rules creates a higher degree of order, neatness and attentive application to work, thereby increasing the productive capacity of every man on the property, and lowering the operative costs. Legal fees, damage settlements, care of dependents, insurance premium rates, loss of time, and loss of experienced labour are all materially decreased, while a considerable burden is lifted from the local community in the number of dependents, cripples, widows and orphans. Improved sanitary conditions and a higher percentage of health among the men creates better artisans and more efficient labour. Whatever means one may adopt to introduce safety measures, it is essential that certain fundamental principles be followed and the following suggestions may be helpful:—

Secure the co-operation of every man and woman on the property.

Let all employees participate in the movement, thereby securing their interest and ready acceptance of safety rules.

Make it clear to all that the management is doing this work for the good of the workmen and their families.

From the outset, indicate plainly that the movement is to be made a success, and that it has the full support of the management.

Simplify rules, but create all that are necessary to guard against every hazardous practice.

Have no rules that are not enforced.

Whenever the judgment of the men has to be relied upon and strict ruling is impossible, have safety suggestions that will guide them to act properly and promptly.

Do not depend too much upon rules and regulations, but remove the danger wherever it is practical to do so.

Those administering safety orders must see that they are carried out. A boss ordering a dangerous roof taken down, or merely a nail driven flush, should not leave until his instructions are executed.

No possibility of conflict of authority should exist.

Constant vigilance must be maintained.

An educational campaign is absolutely essential.

No intoxication should be tolerated, and should be condemned by fellow-workmen, as well as by the management.

Secure the interest of the men during their leisure hours.

Accurate records embodying classifications of injuries must be kept.

Every injury, no matter how slight, should be recorded, and medical attention or first-aid given by competent persons.

Any boss discovering an injury to any of his men which has not been reported, should inquire as to its cause, and reprimand failure to report such injury.

Medical examination of all men employed should be made.

Proper classification of injuries soon reveals a danger spot and the departments needing the greatest amount of attention.

Excessively long shifts cause fatigue, which leads to many accidents.

Eight-hour instead of 10-hour shifts have been found by several companies to reduce the accidents occurring toward the end of a day's work.

Fooling and wrestling should be strictly prohibited, as many accidents are caused in this manner.

It is important to select the best grade of tools and general equipment.

Engage only sober, careful and reliable men.

Periodical bulletins, or booklets, published as a means of furthering the "safety first" movement, arouse the interest of the men. Excellent examples of these are: *The Ingot*, published by the Raritan Copper Works; *The Anode*, published by the Anaconda Copper Mining Co.; *Employees' Magazine*, published by The Lehigh Valley Coal Co.

Organization.

It is impossible to suggest any fixed plan of safety organization, but a review of those created by some of the larger companies will illustrate how the executive end of the work may be handled and an appropriate system adopted. Edwin Higgins has furnished us with a description of several examples of safety organization existing among the mining companies operating on the Lake Superior Iron Ranges. The first form of organization is illustrated by that created by a company which operates a number of large mines on the same range; briefly it is as follows:—

An inspector is in charge of the safety department. His duty is to inspect all mines as frequently as possible, and submit reports and recommendations to the manager.

A committee composed of mine superintendents, head mining captain, master mechanic, assistant auditor, secretary of pension department, safety inspector and the manager, who acts as an *ex officio* member, meets once a month; it confirms or rejects safety recommendations, and considers all accident reports. A committee of mine foremen, consisting of three members, each selected from a different mine, makes periodical trips in and about the mines. The inspector accompanies this committee and incorporates its recommendations in his report. At each mine there is a committee made up of workmen, with duties similar to those of the committee last-mentioned, except that its activities are confined to the mine from which the members are selected. The personnel of this committee is constantly changed, so that in time all employees are given a chance to criticise conditions.

A committee, acting more or less independently of the others, consists of three mine superintendents. It is the duty of this committee to investigate all fatal accidents.

The second form of organization is illustrated by:—

A company operating large and small mines. The safety department is in charge of an inspector who, with the assistance of three experienced miners, inspects each mine at least twice a week. These committee men report to the inspector, who, in turn, reports to the superintendent.

Inspector makes monthly report in triplicate; one copy is returned to the inspector, one to the head of the department, and the third is retained by the superintendent. The department copy is returned with improvement report, when improvements are made. All company bosses and first aid men meet every two months to discuss accidents.

Another form of organization is illustrated by:—

A company operating scattered mines which has an organisation similar to the one just described. The safety committees consist of all foremen from a district, and act under the supervision of a general safety inspector.

Methods.

To secure results, the confidence and enthusiasm of every employee must be sought and maintained. It is necessary to adopt measures that will continually call to the attention of all employees the importance of strictly complying with the rules and regulations, and being always

vigilant of danger, and of the safety of others. Francis P. Sinn emphasizes the necessity of generalizing committee inspection work, as follows:—

"Those most accustomed to certain dangers are, as a rule, the last to recognise those dangers. Any scheme for accident prevention which confines the inspection for safety of any department to men in that department will be defective on this account. It is usually the man unaccustomed to a particular line of work being done, and unfamiliar with the surroundings, who first sees the dangers at hand, and it is often he who has the best suggestions to offer to remedy the dangerous conditions. Whatever remedy is decided on, however, must fit into the particular conditions at hand, and must be entirely satisfactory to the man in charge of the work in question.

"It is at times hard to distinguish between a disregard of danger due to ignorance of its existence, and that due to a braggadocial spirit; the latter is more far-reaching in effect, as it sets a bad example to others and is less easily remedied. An educational campaign must be followed, which will emphasise the safety-first idea and be beneficial to those at the top of the organisation as well as those at the bottom.

"To assure one of the co operation of the men, it is important to demonstrate plainly that the safety campaign is entirely for their good, and it is well to have them participate in the movement from the very beginning; at the same time, having it distinctly understood that the management inaugurated the idea, and will do everything in its power to make the campaign a successful one. Before commencing any work, or giving any publicity to the plan, have a careful survey made of the existing conditions, and avoidable dangers; then formulate the plans accordingly."

The organization created or the person detailed to attend to the safety work must fulfil all duties involved in a systematic and businesslike manner. All suggestions should be acted upon, and those presenting them advised as to whether or not they are of a practical nature and are to be followed. Suggestions will thus be encouraged. Prizes sometimes induce men to take an interest in the work. It is unjust to criticise or blame individuals for accidents due to methods or conditions which they have not been taught to regard as dangerous. On the other hand, publicity should be given to all accidents, as a matter of education. Illustrations showing how such accidents occurred, and how they could have been avoided, should be placed on bulletin boards and shown at public gatherings. Any violation of rules must be severely dealt with, and either carelessness or recklessness duly censored. The Bethlehem Steel Co. has very successfully secured the interest and co-operation of its thousands of employees, in safety work, without any organization. The work is entirely in the hands of their safety engineer, Mr. Funda. They realised that there were many dangers due to unguarded machinery and the general layout of their plant, which it would be impossible to immediately alter or safeguard, and they feared that if suggestions were made by workmen's committees and not at once followed up, a bad impression would be created.

(To be continued.)

S.W. Diamond Fields.

The returns from the diggings of the South-Western Transvaal for the month of January show that 41 different areas contributed a total of 3,449¾ carats, value £22,047 13s., as compared with 3,952¾ carats, value £25,284 13s. 6d. in December. The principal producing areas were as follows (* signifying the Wolmaransstad district and † the Klerksdorp district, the areas in the Bloemhof district being unmarked):—

	Carats.	Value.
Kameelkuil	748	£4,602 12 0
London	414	2,919 17 6
Bloemhof	366	2,221 7 6
Dievedraai	184¾	1,306 2 6
Italie	188½	1,250 0 0
Mimosa	195¾	969 0 0
Christiana	116½	864 17 6
Schweizer-Reneke	108¼	746 13 6
Plessisdam	133½	678 0 0
Blesboktontein	92¾	666 17 6
*Kareepan 137	117½	626 10 0
*Leeuwfontein	77	611 0 0
*Syfergat	64	187 5 0
Goedehoop	56½	173 17 6
Zeventontein	52¾	121 10 0
Cawood's Hope	55¾	375 2 6
Klipkuil	50¾	358 10 0
Koppiesvlei	65¼	301 15 0
Doornbult	36¾	285 10 0
Grootdoorns	33	230 0 0
†Eastleigh	29¼	206 5 0

The rough and uncut diamonds registered at the office of the Detached Assistant Magistrate, Jagersfontein, Orange Free State, during the month of January, 1917, were as follows:—Carats, 39,194¾; value, £130,015 17s. 6d.

New Lisbon-Berlyn.

The ordinary general meeting of the New Lisbon-Berlyn, Ltd., was held recently at Salisbury House, London Wall, E.C. The report stated that no mining operations had been carried on during the year, but the question of utilising the sulphur contents of the pyritic ore had engaged the serious attention of the company's advisers in South Africa, and a trial shipment of 100 tons from the mine dump had been made to one of the South African explosive works.

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THE WEEK IN THE SHAREMARKET.

Many Fluctuations—Tin Shares Active—Business Restricted.

On Friday afternoon Zaaiplaats came in for a shake-out which brought them down to 7s., with a subsequent recovery to 7s. 6d. Springs improved and Sub Nigels fell back. There was very little change in prices on Saturday morning. Springs again hardened, while Sub Nigels were a weak feature. The market opened firm but quiet on Monday morning with a gratifying recovery in Rand Selections, to balance which Sub Nigels were again easier. The low price of tin shares, considering that the figure for the product has risen to £200 per ton or thereabouts, is one of the puzzles that baffle solution. It would appear that if a certain tin share was worth x with the metal at £175, it should be at least worth x+⅛ on an advance to £200, but it does not seem to be so. On Tuesday morning prices were generally on the up grade with the one exception of Springs Mines, which were a turn easier. The chief advances were in City Deeps, Pretoria Cements, Modder Bs. and Modder Deeps. The former seem to have firmly established their position of supremacy over their rival. In the afternoon the tendency was lower. On Wednesday morning most of the previous day's gains were swept away, the only exceptions being Sub Nigels, Kleinfonteins and Wolhuters in the more important stocks. The volume of business was unusually small, only ten stocks being dealt in and none of those in any quantity. One of the most irritating features in the present market is the way in which stock is artificially held up or depressed against genuine buyers or sellers, and the moment the order is executed prices become again normal. There was more business put through on Thursday morning, but practically no change in prices. Zaaiplaats had another run with an opening sale at 8s. 3d. After a parcel had changed hands at 8s. they closed sellers at the price. In outside stocks, Monteleo diamonds were the main feature, reaching 75s. at one time, but at the moment the quotation stands at 71s. 3d. to 71s. 9d.; Dagga Options were sold at 6s. 6d. and old Daggas at 10s.; New Farms are buyers at 1s. 3d.; South Van Ryn sellers at 7s.; S.A. Alkalis, 21s. 6d. to 23s. At the time of writing there is some enquiry for Sakalavas, and sales have been booked at 8s. on favourable reports from the property.

* * * *

On Friday morning the favourites were all weaker, as the quotations below will show. Modder Bs. and Deeps were both a shilling lower on buyers' quotations. Bantjes had a bad knock and after about 1,500 shares had been sold at 5s. 6d. the pump was still going strong. On the credit side Kleinfonteins came in for unexpected support, and after sales at 18s. and 18s. 6d. closed buyers at the latter figure. In the small stocks New Geduld Deeps were bought out at 6s. 1d. and 6s. 3d. and more wanted at the higher price. Besides those already noted, the following stocks show alterations:—Sales: Brakpans, 88s.; City Deeps, 75s.; Mines Selections, 20s.; Consolidated Investment, 18s. 6d.; Consolidated Langlaagtes, 23s.; Government Areas, 54s. 9d.; Sub Nigels, 24s. 6d.; Wit. Deeps, 15s. 6d.; Zaaiplaats, 7s. 6d. Springs Mines were quoted at 53s. to 53s. 3d.; Rooibergs, 8s. to 8s. 3d.; Knights, 42s. 6d. to 46s. 3d.

* * * *

	Fri. 16th.	Sat. 17th.	Mon. 19th	Tues. 20th	Wed. 21st.	Thurs 22nd.
African Farms	7 6*	7 9	7 6*	7 7*	7 7*	7 6*
Apex Mines	5 6*	5 6*	5 6*	5 6*	5 8*	5 8
Aurora Wests	13 6*	—	—	13 0*	13 0*	—
Bantjes Cons.	6 6*	6 5*	6 4	6 5	6 4	6 3*
Brakpan Mines	86 0*	88 0†	87 0	87 0	86 0*	88 0
Breyten Collieries	16 3*	16 3*	16 3*	16 3*	16 3*	16 6*
Brick & Potteries		5 0*	—	5 0*	—	5 0*
British South Africa	—	13 0†	—	13 0†	—	11 9*
Bushveld Tins	0 5†	0 5†	—	—	0 3*	—
City & Suburbans	32 9*	32 6*	32 6*	33 0*	32 3	31 6*
City Deeps	73 9	—	74 0*	78 0	—	75 6
Cloverfield Mines	7 6*	7 10	8 3	8 7	8 3*	8 3
Clydesdale Collieries	—	13 0*	13 0*	13 0*	13 0*	13 0*

*Buyers; †Sellers; A Odd lots; B Ex London.

	Fri. 16th.	Sat. 17th	Mon. 19th.	Tues. 20th.	Wed 21st.	Thurs 22nd.
Con. Investments	—	—	19 0†	—	17 6*	17 9*
Con. Langlaagtes	22 6*	22 6*	22 9*	22 9*	22 9*	22 6*
Con. Main Reefs	17 0†	17 0†	16 9†	16 9†	17 0†	17 0†
Con. Mines Select.	20 0†	20 0*	21 0	20 0*	20 0*	19 9*
Coronation Colls.	31 0*	32 0*	32 6*	—	32 6*	—
Coronation Synds.	3 0†	3 0†	2 9†	1 6*	—	—
Crown Diamonds	3 0†	2 0*	2 0*	3 0†	2 0*	3 0†
East Rand Centrals	—	9 0*	—	—	—	—
East Rand Coals	2 2*	2 2*	2 2	2 2*	2 0*	2 1*
East Rand Deeps	1 1*	1 1*	1 1*	1 1*	1 1*	1 1*
East Rand Props.	10 6*	11 0*	10 9*	10 9*	10 6*	10 9
East Rand Debs.	£60*	£60*	£60*	£60*	£60*	£60*
Eastern Golds	1 2*	1 2*	1 2*	1 2*	—	—
Ferreira Deeps	23 0*	—	—	—	—	23 6*
Frank Smith Diams.	3 8*	3 7	3 9	3 6*	3 6*	3 6*
Geduld Props.	39 3*	39 3*	39 6*	39 9	39 6	39 6
Ginsbergs	—	—	—	—	6 3†	—
Glencairns	—	1 0*	1 0*	1 0*	1 0*	—
Glencoe Collieries	8 6*	8 6*	8 6*	8 6*	8 9*	8 9*
Glynn's Lydenburgs	15 0†	—	—	—	15 0†	—
Goerz & Co.	54 3	—	—	—	—	—
Government Areas	—	54 3	55 0	55 6	55 0*	55 3
Jupiters	6 4*	6 3	6 6	6 3*	6 6*	6 1
Knight Centrals	8 0	8 0	7 10	7 10	7 10*	7 9
Lace Props.	4 9*	4 11*	4 10	4 10*	4 10*	4 10*
Leeuwpoort Tins	12 0	—	12 0†	12 0†	12 0†	12 0†
Luipaardsvlei Est.	8 0†	—	6 6*	7 6†	6 0*	6 0*
Lydenburg Farms	6 0*	5 11	6 0	6 0*	6 0*	6 0*
Main Reef Wests	3 8*	3 8	3 4*	3 5*	3 4*	3 6
Middelvlei Est.	—	—	1 9†	1 9†	—	1 9†
Modder B.'s	147 0	147 6	146 6*	149 6	149 0B	146 6
Modder Deep	126 0*	127 0	127 0	128 6*	126 6*	127 0
Natal Navigat. Col.	—	18 6*	18 6*	—	18 6*	18 6*
National Banks	—	—	£12†	—	£12A	—
New Boksburgs	1 4*	1 4*	1 4*	1 4*	1 4*	1 6*
New Eland Diams.	19 0†	—	19 0†	20 0†	19 0†	20 0†
New Era Cons.	8 9	8 9*	8 9*	8 9*	8 6	8 6
New Geduld Deeps	6 1*	6 0*	6 1	6 1*	6 0*	6 0*
New Kleinfonteins	17 10	17 6*	18 0	17 9*	18 0	17 9*
New Modderfontein	370 0A	370 0†	—	—	—	372 6†
New Rietfonteins	—	0 10*	—	0 10*	—	—
Nourse Mines	22 0*	22 3	22 0*	22 3	21 9*	21 9*
Pretoria Cements	79 0*	—	78 6*	81 0*	80 0*	80 0*
Princess Estates	—	—	1 9†	—	—	—
Rand Collieries	2 3*	2 3*	2 3*	2 3*	2 3*	2 3*
Rand Klips	8 5	8 6	8 8*	9 2	8 9*	8 7*
Rand Nucleus	1 5*	1 5*	1 5*	1 5*	1 5*	1 5*
Rand Selections	64 0	62 9*	64 3	63 6*	63 0*	61 0*
Randfontein Deeps	6 1	6 1*	6 0*	6 1*	6 1*	6 0*
Randfontein Est.	15 9	15 3*	15 3*	15 9	15 6*	15 6*
Roberts Victors	—	12 0†	12 0†	12 0†	—	12 0†
Rooibergs	7 6*	7 6*	7 6*	7 6*	7 6*	7 9*
Roodepoort Uniteds	—	7 0†	—	—	—	—
Shebas	1 4*	1 4*	1 4*	1 5*	1 4*	—
Simmer Deeps	3 0*	3 0*	—	3 0*	3 0*	—
S.A. Breweries	—	—	28 0*	28 0*	28 0*	28 0*
S.A. Lands	4 0	4 0	4 0*	4 0*	4 0	3 11*
Springs Mines	54 3	55 9	55 9	55 6	54 6*	54 6
Sub-Nigels	25 6	24 9*	24 9*	25 0	25 3*	25 1⅛
Swaziland Tins	—	—	30 0†	—	30 0†	—
Transvaal Lands	—	—	—	12 6†	—	—
Van Ryn Deeps	62 0*	62 3	63 0*	63 0*	62 9*	62 9
Village Deeps	—	26 0*	25 6*	25 6*	25 6	25 6*
Vogel. Con. Deeps	1 6†	1 6†	1 6†	1 6†	1 0*	—
Welgedachts	22 6†	—	—	—	—	—
West Rand Cons.	5 6*	5 0*	6 0†	5 0*	5 0*	5 0*
Western Rand Ests.	1 6*	1 6*	1 6*	1 6*	1 6*	1 9†
Witbank Collieries	43 6*	44 0*	44 0*	44 0*	44 0*	—
Witwatersrands	47 6†	—	47 6†	47 6†	47 0†	—
Wit. Deeps	—	16 0*	—	17 6†	16 0*	—
Wit. Townships	—	18 0†	—	—	—	—
Wolhuters	10 0	10 0*	10 1	9 10*	10 1*	10 3
Zaaiplaats Tins	8 3	7 9	7 4	7 4	7 3	8 0

Union 5 per cent., £100½*, £101 1s. 3d.†, £101 11s. 9d.*, £100 11s. 9d.*, £100 17s. 6d.*, £100 13s. 6d.*

*Buyers; †Sellers; A Odd lots; B Ex London.

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CORRESPONDENCE AND DISCUSSION.

Oceana Development Company.

To the Editor, *South African Mining Journal.*

Sir,—In your issue of 6th January last, amongst "Notes and News," you state that a sum of £10,000 has been set aside by the Oceana Development Company, Ltd., for the purpose of boring on the farms "Eendracht" and "Koppieskraal." This is entirely erroneous, and I enclose for your information a reprint from the *Mining World*, London, of 20th January last, giving the substance of the agreement arrived at in connection with the contemplated boring to be undertaken on the farms "Eendracht" and "Koppieskraal."—I am, etc.,

H. J. MACRAE.

Royal Chambers, Johannesburg,
21st February, 1917.

[Mr. Macrae, it will be noticed, does not claim to write on behalf of the company, but on behalf of those who have agreed to finance the drilling. A report of the meeting at which the agreement was discussed will be found at the end of this issue.—Ed., *S.A.M.J.*]

PERSONAL.

Members of the Chemical, Metallurgical and Mining Society and the South African Institution of Engineers are visiting the factory of the Pretoria Portland Cement Company, Ltd., this (Saturday) afternoon in order to inspect the up-to-date methods by which the local product is enabled to compete with the imported article. Those desiring to participate in this visit should notify the respective secretaries.

* * * *

At the annual meeting of the Mine Managers' Association last week, Mr. Percy Cazalet, in seconding the adoption of the report and accounts, suggested the sending of a cable of congratulation to Colonel Trump and Sir H. Ross Skinner. This suggestion was adopted, and the meeting agreed to the adoption of the report and accounts. Mr. J. E. Healey was elected President, and Mr. John Wessels Vice-President, and the following were elected members of the Council:—Messrs. J. R. Thom, A. E. Payne, P. Carter, E. H. Bulman, H. Mitchell, O. P. Powell, E. J. C. Meyer, A. J. Walton, C. Glyn, G. G. Holmes, and H. G. Nitch.

For some time past Rhodesian farmers have been considering the question of establishing a canning factory in Mashonaland. The proposed scheme attracted the attention of the British Government, and the Board of Trade suggested to the Director of Army Contracts at the War Office that it would be to the interests of Rhodesia and the War Office if the Army Contract Department kept in touch with the scheme, with a view ultimately of drawing part of its supplies from Rhodesia. The Board of the Chartered Company has undertaken to keep the War Department posted in the development of the scheme. With the object of securing all information relative to a factory and meat-freezing plant, Mr. M. E. Cleveland, M.L.C., left for England and America last year. Mr. Cleveland has now informed the local Provisional Board that he had secured the services of a fully-qualified adviser in Texas, who will leave shortly for Rhodesia. Mr. Cleveland also states that he will be able to arrange for the necessary machinery as soon as the scheme is proceeded with. It is now stated that a prospectus will be issued to the public

ANSWERS TO CORRESPONDENTS.

All inquiries addressed to the Editor must bear the writer's name and full address. We cannot reply to inquiries by letter, but telegrams with replies prepaid will be answered. Correspondents are requested to write their names and pseudonyms distinctly.

C. Howard (Lydenburg).—Thanks. Will try to use.

"Anxious."—We should hold on, even if "a great error in mining" has been made.

"South Coast" (Karridene).—Yes, they should improve in time. It is impossible to answer your other question, as no one can predict what is going to happen.

"W. P." (Leeuwdoorns).—(1) Very little so far. (2) Yes, as a speculation. (3) Not quite.

"Lucretius" (Kroonstad).—(1) Nothing wrong; dividends ought to be safe. (2) Impossible to advise you, as everything depends on future development. (3) Yes.

"Deen." (1) Journal of the 10th has been forwarded. (2) Yes, you cannot go far wrong with either.

"J. R. W."—We should wait until the scheme is matured, and some more development done.

"A. F. R." (Capetown).—Both highly speculative.

"J. Smart" (Germiston).—The assets of both companies were distributed among several different purchasers, and we are unable to trace who they were. The address of the liquidators of the first named company is Corner House, Johannesburg. We doubt if they can help you now.

"William W." (Selukwe).—(1) Prospects good. Price due to combination of both factors named. (2) Merely market reasons. (3) Both excellent.

"W. B." (K. Deep).—(1) About five to seven years. (2) Yes; about seven years.

"L. E. C." (Observatory).—We know nothing beyond the recent official reports, which as a shareholder you have doubtless studied.

"Clan" (Durban).—The reasons were fully set out in recent issues of this paper, which you doubtless missed in your absence. Poor development is the reason. Better hold now. Cannot say whether a dividend will be paid this year.

"W. S." (Kingwilliamstown).—(1) Unfavourable development. (2) Impossible to say.

Copper Ores.

Mr. H. B. Maufe, Director, Geological Survey, Bulawayo, writes as follows:—Whilst special attention is being devoted to the copper ores of Rhodesia on account of the present demand for copper and the high prices ruling, the ores of the Tuli district appear to be neglected, but it is probable that the higher grade ores of this field might be mined profitably by selling them to the smelting works at Messina. The general manager of the Messina (Transvaal) Development Company states that his company are now purchasing small amounts of copper ores from local mines. The company pays for 85 per cent. to 100 per cent. of the copper contained in the ore, depending on the grade of the ore, and advance 60 per cent. of the nett value of the ore as soon as it is sampled. The smelting charge is £2 per ton, subject to a bonus for ores containing lime and iron, and a penalty for ores containing an excess of silica. There is a further charge for railage and ocean freight on matte, refining, etc., which now amounts to about £25 to £30 per long ton of copper contained in the ore.

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THE WEEK IN THE MINING MATERIAL AND ENGINEERING TRADES.

Shipping of Paramount Importance—Estimated Delay in American Shipping—Effect on Business—Town Not Increasing Electric Light Connections—Timber Quoted "Subject to Being in Stock."

The shipping question is of paramount importance, but the opinions of merchants and importers differ greatly, although neither belittle the position. The majority hold the opinion that the submarine menace is pretty well under control. The other opinion is that, supposing the submarines and mine laying boats are kept under control, the British Government will require more and more shipping as the European spring advances, hence a curtailment of supplies. A member of the Chamber of Mines in close touch with the department which recommends the special importations, states that already it is more difficult to obtain the endorsement of urgency on the requisitions, as the regulations are being drawn much tighter. As regards American shipping, so far the arrivals have been fairly regular, but no one on this side seems able to forecast the future in that direction. After all it is a matter of guessing, as much will depend upon what America, as a nation, will do. One representative of an American firm is more venturesome than the rest. He states that the laying up of shipping in American ports will mean quite a month's delay at least, in obtaining those goods which have already left the factories for the coast. It appears from his latest information that the railways became so blocked that goods were declined for export unless the railway authorities had an undertaking that they would be shipped and not be kept to further block up the wharves.

The Effect on Business.

The general tendency is a waiting one, and nobody with stocks is looking for fresh business, being content to carry on with their regular clients. The manager of a firm in a big way of business, and only dealing with the better class of traders, is at a loss to know why money has become more stringent since the close of the year. A new feature has occurred in the buying departments of the mines, as the official buyers will negotiate for essential lines at reasonable prices. Hitherto this kind of procedure has been discouraged, as the practice of putting out lists of requirements on the Commercial Exchange has been rigidly adopted without fear or favour, but the war conditions undoubtedly have varied many regulations and methods of long standing. In this connection it is very evident that the mines are willing to put more and more capital into stores and spares, as they are looking to the future and so guard against contingencies. Another significant feature, as a precautionary measure, is that the Johannesburg Municipality has given official notice that no more electric light connections will be made as regards new buildings. From enquiries made in that quarter, it appears there need be no misgivings as to the present electrical supplies being kept up, but they do not expect to get extra supplies of the necessary machinery and plant to cope with any extra requirements, at all events for the present.

Buildings and Building Materials.

It is estimated by a professional man that a house costing £800 before the war, now costs about £1,000, which is easily explained. For example, in pre-war days the timber, roofing iron, and builders' ironmongery, cost for such a house, about £200, but since, it has almost doubled, hence the additional cost. The ordinary stock brick has recently advanced 5s. per 1,000, and many jobs in the town and suburbs are often held up awaiting bricks. The reason is that the rainy weather has damaged and spoilt many thousands of unburnt bricks, on the drying stacks. In connection with this drying, it is becoming more and more difficult to find covering in the shape of old bags which are useless for coal, and even these have doubled in price of late. It is said to take from four to six weeks to complete a decent sized kiln of bricks from start to finish. Now comes the very important question of timber, which is on the advance, although our standard list of quotations has not recently been altered, but what happened during the week was that a firm holding decent stocks suddenly jumped their price on the Commercial Exchange from 12½d. to 13½d. per foot, which brought the minimum price into line with the standard rate, from 1s. 1½d. to 1s. 3d., according to quality and lengths. In connection with new contracts, the merchants will only quote from present stocks, and suppose a tender will not be submitted for a fortnight or so, the quote stands good, but only subject to the timber being in stock in Johannesburg. As regards galvanised roofing iron, that has advanced fully a penny per foot, and now the shilling stage has been passed, as the recognised quotations are from 1s. 1d. to 1s. 1¾d. for 24 gauge, according to lengths. It is difficult to purchase parcels in the open market, as stocks are small and so well held that merchants will not quote for even small lots, outside their regular customers. The outlook for supplies seems dimmed, as in the ordinary way there are only small quantities expected from Britain to complete old orders, and none from America for the next few months.

Mining Timber and its Assistance.

The price of ordinary mining poles remains the same, as the whole of South Africa has made a dead set upon the Rand market. The attraction is that when a farmer wants a little ready money, he has only to look around and gather a truck load of mining poles and send them to Johannesburg, where there is always a market—at a price. It is surprising what a number of firms and companies are ready with ample funds to give an advance when required, immediately a consignment arrives at the station here, or even before, when the senders have a little standing. However, the outstanding feature of the mining timber business of late is that specialists have undertaken the business of supplying rough square logs from the largest and straightest of the timber finding its way to Johannesburg. At one time the mines would not look at such improvised substitutes for Baltic and Oregon logs, but now it is encouraged because the arrival of oversea supplies is unreliable and values have mounted up to almost prohibitive rates, and obviously if anything approaching substitutes can be found, they are welcomed. The class of South African timber referred to

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has risen from 5s. to 12s. 6d. per ton and the price to-day is 50s. per ton for the best and most suitable for log making.

The Chemical Trade.

The absolute essentials for the mining industry are mercury, cyanide and zinc, of which the Witwatersrand mines have plenty to last them well over this year. However, it is not so with the Rhodesian and outside mines generally, all of whom are beginning to realise the necessity of accumulating stocks. Hence very decent orders, particularly for mercury, come into the Johannesburg market, and so far they have been fulfilled, but people at a distance should thoroughly understand that supplies outside those held by the mines are anything but inexhaustible.

Oils, Colours, White Lead, Turps, etc.

Cables from London are anything but plentiful, however the latest one available states that linseed oil has advanced 2d. per gallon, and other lines of a similar nature are hardening. In Johannesburg increases will take place from March 1st. In brushware the advance will be ten per cent., and the paint ingredients from about 2½ per cent. upwards. Business has been extra good during the past ten days, as builders and other have been laying in stocks, in case of untoward happenings through shipping interruptions and so forth.

Second-hand Goods.

Second-hand goods are scarce and likely to remain so, as very few places are being pulled down, simply because of the demand for all sorts of houses, which are readily let when they become vacant. The outstanding feature, during the rains especially, is the demand for galvanised iron, and anything decent is readily sold at from 8d. to 9d. per foot. Good second-hand deals are 10d., ceilings 2¾d., and flooring 1½d. Wire netting, 1 in. mesh by 5 ft. coil, 52s. 6d.; do., 1½ in. by 5 ft., 42s. 6d. Boiler tubes, 2 in. by 12 ft., 3s. 9d. per length. Standards, 6 ft., 27s. per dozen. Barber wire, 27s. per 500 yards; plain, 19s. per 500 yards.

Revised Price List.

Approximate war prices, subject to quick change.—Mining and building hardware: Iron, imported, ¼ round, 40s.; up to 1 in., 32s. 6d.; 2 in. to 6 in., 27s. 6d. per 100 lbs. Ditto, square, up to 1 in., 27s. 6d.; 1⅛ in. to 2¼ in., 25s.; 2½ in. to 5 in., 25s. Flats, 3-16 in., 37s. 6d.; all from ¼ in. up, 35s. Angles, ⅛ in. to 3-16 in., 40s.; ¼ in., 40s.; 5-16 in. to ¾ in., 30s., excepting 5 x 4 x ⅝ in.; mild steel bar, 4¼d. lb.; drill, 7½d. lb.; steel plates, 10ft. by 4ft. by 1-16th in., 35s.; ⅛in. by 3-16th in., 32s. 6d.; ¼in. to 5-16th in., 31s.; ⅜in., up to 30s.; 10ft. by 5ft. by 1-16th in., 36s. 6d.; ⅛in. and 3-16th in., 64s.; ¼in. to 5-16th in., 32s. 6d.; ⅜in., up to 31s. 6d.; intermediate sizes up to 12ft. by 6ft. by 1-16th in., 37s.; ¼in. and 3-16th in., 34s. 6d.; ¼in. and 5-16th in., 33s.; ⅜in. and up, 32s., all at per 100lb.; hexagon and cuphead bolts,, ¼in. dia., 1s. 9d. lb.; 5-16in. dia., 1s. 6d. lb.; ⅜in. dia. up to 3in. long, 1s. lb.; ⅜in. dia., 11d.; 3¼in. and up long, 11d. lb.; ½in., dia. up to 2½in. long, 62s. 6d. 100 lbs.; ½in. dia. and 2¾in. up long, 60s. 100lbs.; ⅝in. dia. up to 2½in. long, 55s. 100 lbs.; ⅝in. dia. 2¾in. and up long, 52s. 6d. 100 lbs.; ¾in. dia. up to 2½in. long, 52s. 6d. 100 lbs.; ¾in. dia. 2¾in. and up long, 50s. 100 lbs.; ⅞in. and 1in. dia., same price as ¾in. diameter; nuts, ⅜in., 1s. 3d. lb.; ½in., 65s.; ⅝in., to 1¼in., 62s. 6d.; 1⅜in. and 1½in., 70s.; 1⅝in. to 1¾in., 75s.; 2in. up, 85s.; washers, all sizes, 45s.; rivets, 3-16in., 1s. 6d. lb.; ¼in., 5-16in., 1s. 3d. lb.; 7-16in., ⅜in., 9½d. lb.; ½in., 52s. 6d.; ⅝in., 50s.; ¾in. up, 49s. 100 lbs.; shoes and dies, 32s. 6d. to 35s. per 100 lbs.;

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rails, £23 per ton; picks, 4lbs., 27s. per doz.; shovels, 32s. 6d. to 50s. per dozen; drill hammers, 5¼d. lb. to 6d. lb.; hammer handles (best American), 14 in., 3s. 6d., 24 in., 7s., 30 in., 9s. 6d., 36 in., 13s., per dozen; metal, anti-friction, 1s. per lb.; galvanised iron, 24 gauge, 6 ft. to 10 ft., 1s. 1d., 11 ft. 1s. 1¾d., 12 ft. 1s. 1¾d.; 26 gauge, 6 ft. to 8 ft. 9½d.; 9 ft. and 10 ft., 9½d.; flat galvanised, 18 to 24 gauge, 40s.; 26 gauge, 12s. 6d. 100 lbs.; floor brads, 40s.; ceiling, 42s. 6d.; wire nails, 37s. 6d. to 55s. per 100 lbs.; solder, 50 per cent., 1s. 3d. per lb.; locks, rim, 48s.; mortice, 60s. dozen; barbed wire, 26s. to 30s. 100 lb. coil.

Timber: Deals, Baltic, 9 x 3, short and medium, 1s. 1½d.; longer lengths, 1s. 2½d. to 1s. 3d. (Oregon, 1s. 1d.); flooring, 4½ x ¾ and 6 x ¾, 6¾d. per sq. ft.; do., 4½ x 1¼, 9½d.; and 6 x 1⅛, 9½d.; ceilings, 6 x ½, 3¼d. to 3½d. per sq. ft.; Oregon, 4 x ½, 4¾d.; pitch pine, 8s. per cub. ft.; Oregon, 5s. 9d. to 6s. per cub. ft.; clear pine, ½ in. x 12 in., 7½d. per ft.; 1in. x 12in., 9d. to 10d.; teak, small planks, 14s. 9d. per cub. ft.; do., large, 15s. 6d.; jarrah, 9s. 6d. per cub. ft.; poplar, 1 in. x 12 in., 10d.; scantling, 1s. 1d. to 1s. 2d. per ft., 3 x 9.

Bricks, cement, lime, etc.: Cement, nominal, 34s. 6d. per cask; Pretoria Portland, 9s. 3d. per bag; 8s. 3d., truck loads; lime, white, 7s. 9d.; truck loads, 6s. 9d.; slaked, do. 5s.; blue, 3s. 3d.; plaster lime, 4s.; bricks, stock, delivered, 37s. 6d. to 45s.; wire cuts, 50s. to 70s., pressed 70s. to 80s. per 1,000, road transport difficult to obtain; salt and white glazed bricks, £27 10s. per 1,000; tiles, roofing, £17½ square; glazed tiles, 10s. 6d. to 17s. 6d. yard; paving cement tiles, 8s. 6d. yard laid; terra cotta tiles, £15 per 1,000; reinforced concrete columns, 6 ft. plain, 22s. 6d., fluted, 24s.; fireclay bricks, £9½, good average, per 1,000; clay chimney pots, 80s. per doz.; fire clay, 37s. 6d. ton on rail.

Oils, paints, lead, oxides, glass: Linseed, raw and boiled, 30s. to 32s. 6d. per 5 galls.; white lead, 70s. to 72s. 6d. 100 lbs.; turpentine, 52s. 6d. 2/4 galls.; 10_1, 57s.; coal tar, imported, 10s. to 12s. 6d. per 5 galls.; oxide in oil, 36s. per 100 lbs.; dry oxide, 21s. to 22s. 6d.; S.A. crude oxide, 12s. 6d.; linseed oil putty, 4s. 6d. per 12½lbs.; bladders, 36s. casks of 100lbs.; grease A.F. axle, 23s. 6d. to 25s. per 100 lbs.; tallow, 1s. per lb.; White Rose paraffin, 17s. 3d. 2/5; Laurel do., 17s.; petrol, 27s. 6d. 2/4; motor oil, 6s. to 7s. 9d. per gall.; engine lubricating oils, 24s. to 36s. 6d. per case; cylinder, 26s. to 40s.; paints in tins, 10d. to 1s. per lb., according to quantity, and if ordered to be mixed, 20 per cent. on pre-war rates. British plate-glass, 1in., 3s. 6d.; do., mirror, 4s. 6d.; window, 16oz., 1s. to 1s. 3d. foot.

Chemicals: Mercury, £22 per 75 lb. bottle; bichromate potash, 3s. 6d. lb.; chlorate, 3s. lb.; permanganate, 10s. 6d. lb.; alum, 5d. lb.; carbolic acid, 6s. 6d. lb.; borax, 87s. 6d. 100 lbs.; cyanide soda, 1s. 5d. lb.; hypo, 9d. lb.; acetate lead, 75s. 100 lbs.; litharge (assay) 70s., (commercial) 57s. 6d. 100 lbs.; zinc sheets and blocks, 1s. 6d. lb.; plumbago crucibles, 5d. per number.

Electrical Goods: Lamps, high volts., British, Holland & American, 16s. to 21s. wholesale, and 21s. to 27s. dozen, retail; carbon lamps, 7s. 6d. per doz.; pure rubber flex, 5d. to 6d. per yard; 3/20 coils of wire, 25s.; do., 3/22, 21s. 6d.; tubing, 13s. to 14s. 100 ft.; keyholders, 4s. 6d. to 5s. each; round blocks, 3½ in., 3s. 6d. doz.; lamp holder cord grips, 13s. 6d. to 14s. 6d. doz.; switches, 5 amp., 13s. to 14s. doz.; British glass shades, 24s. to 36s. doz.; Bohemian shades finished; porcelain shackles, 14s. 6d. doz.; do. bobbins, 9s. 6d. to 10s. per 100; cleats, 18s. per 100; P.O insulators, 18s.; motor, 3 h.p., about £30 to £35, new

Enterprise Gold Mining and Estates.

The report for the year to June 30 states that the accounts show a loss of £874, and after deducting the credit balance as at June 30, 1915—£175—there remains a debit balance of £688, which the directors have transferred from reserve account. Owing to the continuance of abnormal market conditions and the impossibility of obtaining reliable quotations for the company's share interests, the usual note dealing with the item share interest on the balance sheet has again been omitted; all share interests have, however, been taken in at cost or under. The directors have allocated the balance of the amount standing to the credit of reserve account—viz., £24,301—towards writing down certain share interests to make provision for possible depreciation or loss on realisation as and when normal conditions return.

Messrs. Merz & McLellan have been asked to undertake an investigation into the financial position of the Durban Corporation's electrical undertaking. The circumstances under which this arrangement has been made are indicated in a report of the Corporation, which stated that last July the necessary documents should be forwarded to the London agents. The references were:—(a) Whether the plant of the electrical undertaking is worth the amount of the liability placed upon it. (b) Whether the provision out of revenue for depreciation and renewals has been sufficient; and (c) On what basis should depreciation and renewals allowances be made in future. (d) Are all the tariffs in force by the department for the supply of current profitable to the department, and if not, what suggestions as to their alteration could be made? (e) What is the lowest price at which power could be sold, keeping in mind the cost of production, capital expenditure, etc.?

New Heriot.

The results of last month's operations at the New Heriot was:—Tons milled, 12,900; gold recovered, 5,273 ozs.; profit, £6,719. The depreciation in results is due to a stoppage in milling operations following on an accident to the main haulage gear.

East Rand Proprietary Mines.

Eight hundred and twenty stamps milled 144,000 tons, yielding 43,476 ozs.; fine gold recovered was valued at £180,687; profit for the month £30,151. The decreased profit is due mainly to the cost of handling the additional water and to smaller tonnage.

Worcester G.M. Co.

At a meeting of shareholders of the Worcester Gold Mining Company, convened by Mr. F. Lindenberg, the official liquidator, the latter presented a disappointing report on the mining operations of the past year. He stated that in spite of severe economies and the reduction of the staff there had been a loss during the first few months, followed by a slight improvement towards the end. Some Capetown shareholders who were present put a number of questions, and held to the view that the Barberton mine should be continued in full work and be further developed. Mr. H. C. Meiring, a former director, said that he was firmly convinced that the mine would yet pay dividends. Two resolutions were unanimously adopted, authorising the liquidator to raise loans for clearing off the liabilities and for the further development of the mine. A further resolution fixed the liquidator's remuneration at £600 for the first year.

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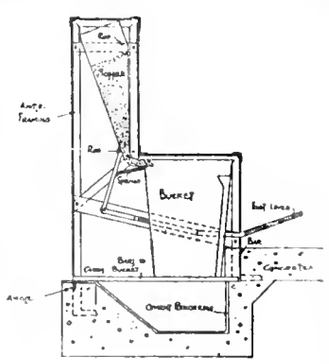

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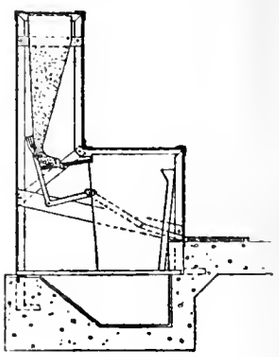

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Engineering Notes and News.

THE WAVE-TRANSMISSION SYSTEM AND ITS USE IN DRILLING

[By E. M. Weston.]*

Synopsis.—The invention of a sixth method of power transmission is described. This has been recently patented in England and promises to reduce greatly transmission and plant costs. Its application to rock drilling is described. Power is transmitted by means of alternate compressions and expansions in a system of pipes filled with water.

The wave-transmission system is claimed to be a new and revolutionary method of transmitting power in variable amounts over variable distances with efficiencies in small installations greater than that of elecricity and in all cases equal efficiency at a smaller cost of installation. These are big claims for a new invention: but I believe that this system has an enormous field of usefulness and that the invention is of importance equal to or greater than those of wireless telegraphy and electrical transmission of power. What is wave transmission? Wave transmission depends for its possibility on the fact that water is compressible and elastic. It is popularly supposed that water is incompressible, but it is really very many times more compressible that steel. Water is compressed about 0.000046 for every atmosphere. It will easily be shown by a simple calculation that in a pipe one inch diameter, 600 ft. long with a pressnre of 1,000 lb., the compression of water amounts to many cubic inches. Now let us imagine a pipe completely filled with water, having a plunger at one end fitting in it and a similar plunger at the other end. If, by means of any prime mover the plunger is made to reciprocate, alternate waves of compression and rarefaction are set up, which travel along the pipe. These waves travel at the same rate as sound travels in water, about 4,800 ft. per second. The length of the wave is this distance divided by frequency, or the number of pulsations per second. It is obvious that at the other end of the pipe a similar piston will reciprocate in sympathy with the plunger of the prime mover. The prime factor is the mean pressure times the mean flow. Angle of phrase and flow and influence when in place produce work, otherwise they are mutually dstructive.

The power-transmission pipe is first completely filled with water at a pressure of 100 lb. per square inch. The plunger has an auxiliary pump attached for making up any loss by leakage. The pressures producing waves may be anything from 500 lb. upward; for rock drills 1,000 lb. will be employed. Now it is obvious that, if in a simple pipe line supplying power to a distant plunger, the plunger is stopped, the waves will rebound and " resonance " will be set up: otherwise the pipe will be subjected to such stresses that it will burst. The inventor discovered, however, that if a vessel of a certain cubic capacity in relation to the displacement of the piston plunger and completely filled also with water attached to the pipe line, the vibrations would be absorbed and the only result of turning off one or all of the machines worked from the pipe line would be to return some or all of the energy generated in waves to the plunger (or the rebound as it were): so that the work from the prime mover is always proportional to the work being delivered. The losses of power in friction in the pipe line are small because this system differs from hydraulic systems, as these is no flow or transference of water along the pipe line. As before stated, these losses compare favourably with those of electical transmission. If it is necessary to take off branch pipes to work tools along the main pipe lines, these in ordinary course could be taken only if at certain points along the wave lengths: but by inserting a " condenser," which is nothing but a plunger of certain weight with a spring at each end reciprocating in the pipe, the wave length can be changed and power branch lines can be taken off at any point. Water is the liquid most suitable for general work in pipe lines for wave transmission, but an important advantage is gained by the fact that, by introducing a flexible diaphragm or a plunger, the working portions of tools or motors can be filled with oil causing waves with equal facility.

From both the scientific and practical points of view one of the most interesting facts about wave transmission is its similarity in many features to electrical transmission. The points of resemblance are not mere coincidences, but go to prove an important fact: namely, that this purely physical method of transmitting energy is clearly allied

* In the " Engineering and Mining Journal " of New York.

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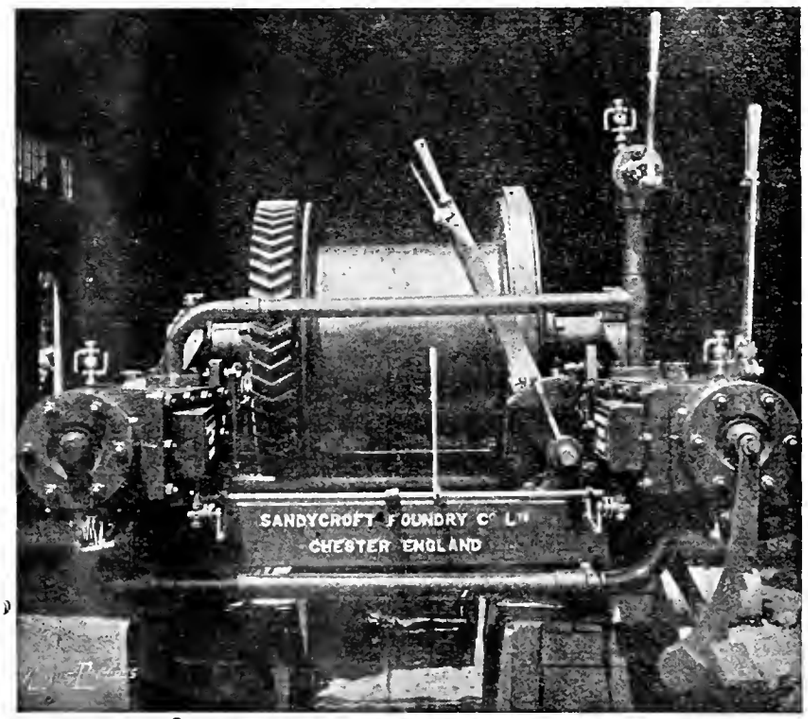

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and is for all practical purposes a sister method to electricity, more particularly to the alternating-current system. Anyone with a knowledge of electricity will find it easy to understand wave transmission.

ANALOGY OF WAVE AND ELECTRICAL TRANSMISSION.

The laws of formulas of wave and of electrical transmission coincide to the extent that they are nearly interchangeable. Most of the phenomena of electricity have been parallel to wave transmission. The accompanying table shows this resemblance.

ELECTRICAL EQUIVALENTS TO WAVE TRANSMISSION.

Alternating current ..	Alternating pressure and flow of liquid caused by plunger of generator
Volts	Pressure
Amperes	Flow
Power factor	The customary electrical formula and not the hydraulic one. Mean pressure × mean flow × cos. of angle of phase Flow and pressure when in phase give work when otherwise are mutually destructive.
Inductance	Weight or inertia (in regard to condensor effect)
Capacity	Elasticity of fluid medium
Resistance	Volume capacity in proportional to press and flow
Condenser	Elasticity proportional to inertia
Transformer	Differential piston
Generator	Generator
Motor	Motor
Wires or line	Liquid column in pipes
Resoance and surge ..	Exact equivalent, but controlled absolutely by simpler apparatus
Single-phase or poly-phase system	Each has its exact counterpart in the wave system
Synchronous or asynchronous motors ..	
Rotary or reciprocating motors	
Conversion of energy into heat directly by friction	By passing current. That is, liquid of any given flow and pressure through a smaller section of piping the pressure and velocity increase in proportion and both skin friction and molecular friction occur and are dissipated in heat

It will be noted that either reciprocal or rotary motion may be produced at the end of a wave-transmission line. For reciprocal motion either two or three pipe lines are usually employed; but by shortening the wave length and number of plungers, these could be made to work in a way to produce rotary motion. That means that a satisfactory motor (equivalent to driving a motor by single-phase alternating current) can be constructed exempt from many of the drawbacks of such an electric motor. Theoretically, equally high efficiencies are obtained in electrical and wave systems of transmission. In commercial electrical practice, however, it is well known that considerations of capital cost induce the adoption of efficiencies well below the theoretical. In general industrial practice the lower initial cost of appliances of wave transmission is expected to result in obtaining either the same efficiencies as in electricity at a lower initial cost, or obviously higher efficiencies at the same cost. The field of application is broad, as there are at present five methods in commercial use for the transmission of power. These are steam, direct mechanical, electric, compressed air, and hydraulic, the last being comparable to direct-current electricity, as wave transmission is to alternating current. Each of these has its field. Some fields are, however, very inefficiently occupied, and the advantages and defects of each system for any particular work are well known and need not be repeated. Wave transmission as a system of power transmission possesses the following advantages: It is simple—any ordinary mechanic can instal and keep in order these few moving parts; it is adaptable—it can efficiently perform much that any of the other systems are capable of; it is portable—a 10-h.p. generator could be lifted by a man.

BREADTH OF APPLICATION OF THE SYSTEM.

The initial cost of installation is naturally very low as no expensive copper lines or insulators are necessary. The maintenance charges are low because there are no cranks or cooplings in the motors and the chief item would be attention to the packing of the plungers and maintenance of pipe lines. For mining, its high efficiency and the absence of any danger from fire make it a competitor of electricity—in coal mining for coal cutters, drills, pumps, hoists and conveyors. In metal mines the wave-transmission rock drill promises to compete with the air-driven rock drill to make one source of power apply to all underground mechanical appliances. In mechanical shops it is already being used for riveters and calkers and has a field in shearing, stamping, hammering and pile driving and for portable stone chippers and metal punchers. In workshops and factories it offers important advantages in running various tools from their own motors, dispensing with overhead shafting and belting. In pumping, a very simple pump can be designed for all conditions of work—one that will run submerged and be very light. Experiments have also been made showing that it is probable that the ideal method of gear reduction for rail cars, motor cars and, above all, steamships of the largest power has been found. Railway signaling and submarine work also appear promising fields of application. One of the most striking experiments in connection with wave transmission is the production of boiling water by friction in small tubes at the end of a long coldwater column. This can be applied for heating houses and factories most economically. It is being employed for submarine signalling.

Wave transmission was discovered by George Constantinesco, a Roumanian engineer. The system was worked out mathematically, and patents were applied for before a single demonstration had been made, and working models were first made for the patent authorities. The diameter of the piping in the transmission line is determined by

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the pressure adopted and the power to be transmitted. The greater the pressure in the liquid column the smaller may be the diameter of piping. In experimenting with a line 50 feet in length with right-angle bends, it was found that 1-in. diameter wrought-iron pipe of ordinary good steam quality would convey 10 h.p. with high efficiency. Hydraulic piping and increased pressure will, however, increase this figure 300 or 400 per cent. For many applications steam piping can be used, but hydraulic piping will no doubt be most largely employed. The practical engineer will at once ask what effect the vibration set up will have on the pipe line and whether the power can be transmitted without too great a loss when the pipes are much bent, as they would be when used in mining. It is stated that experiments have shown that only a very ordinary amount of bracing is necessary to steady the pipes, and the vibration does not seem likely to cause trouble with perfectly designed joints. The system has been in use in engineering shops for some months. The effect of the bends does not appear to be serious, and the power is readily transmitted through a flexible hose to a rock drill. The water used in such a system must of course be free from grit and acid.

ITS APPLICATION TO ROCK DRILLING.

The Haddon drill is the first attempt to apply wave transmission to drilling. It is evident that a system that produces reciprocal motion directly and in which the frequency of the blows can be increased up to any limit desired has great possibilities in drilling rock used in either a hammer or a piston-drill machine. The Haddon drill is a piston machine and is in outward appearance similar to an air-operated drill except that there is no valve and no valve chamber is apparent. It consists of a piston mounted between a rear and a front bearing and "floating" between a strong spring on the front and a weaker one on the back. The rear of the piston is cut for the ratchet and enters a rear chamber containing pawl and ratchet for giving rotations. This chamber is full of water connected with the power line by a hose The wave of compression sweeps into this chamber and forces out the piston against the spring, which brings it back on the return stroke, which is governed by the rear spring. The drill has few moving parts. The introduction of springs has been criticised but it would be easy to arrange the return stroke by wave motion. Tests, however, show that satisfactory springs having a long life can be procured, and they are easily changed if necessary. The length of stroke is controlled by opening or closing the cock, but apart from the momentum of the piston and tool being decreased by the shorter stroke, the strength of the blow remains the same. This allows holes to be rapidly collared on a very short stroke. A positive mechanical revolution is being introduced into later designs of the drill, brought about by an auxiliary piston panel acting as a floating ratchet disk on the piston. This will be an important point in any hammer-drill model. The following questions naturally suggest themselves to the practical mining engineer: Will not the return stroke of such a drill be weak, causing constant fitchering? It is reported that trials show that fitchering rarely occurs, owing to the constant tugging action due to the repeated blows of the wave motion going on whether the drill be struck or not, and that this is a most marked feature of the drill. With such high pressures will not leakage be excessive? It is said that during lengthy trials leakage is trapped to supply water for the drill, but owing to the design of the drill the bearing which has to resist leakage can be made very long and can be easily replaced by any special hydraulic design that may be found suitable. Personally, I consider that only long underground experience will prove whether this consideration will be vital. It is easy to calculate that a certain percentage of leakage can be allowed without vitally impairing the efficiency of the system. The drill can be used with either solid or hollow steel, and naturally the system lends itself splendidly to the use of hollow steel and water injection. Acid or gritty water must not be employed, or the springs and the interior of the drill must be of some acid-resisting alloy. The latest type of drill is designed to strike 1,000 blows of a force of about 40 to 50 ft.-lb. and weighs only about 180 lb. The original design struck 500 blows a minute and showed itself a rapid driller.

SHORT-STROKE PISTON DRILL PREFERABLE TO A HAMMER DRILL.

I have long held the opinion and expressed it in my writings that the ideal drill for really hard work is not the hammer drill, but that if a piston drill could be designed to work on a very short stroke and to strike 1,000 blows or more per minute and deliver water under pressure to the drill bit, it would prove the ideal tool. It will be remembered that on certain tests on a 2½in. torpedo drill in California it was found that the fastest drilling was done with a 2½in. stroke, running about 930 strokes per minute. It is, however, recognised that hammer drills give more time in changing steel, but with a modern rock-drill chuck this is not vital. The trials of the first model of the Haddon drill ran for several months near London and were witnessed by numerous engineers. The inventor is convinced that leakage can be easily controlled and claims that while with the compressed-air drill the efficiency is under 10 per cent., the efficiency of a wave-transmission system will be between 60 and 80 per cent.; that the cost of installation will be only one-half, the power consumption one-quarter and maintenance charges half, allowing for more expensive hoses and couplings; that there are no valves or delicate parts, and that more powerful and frequent blows can be delivered on a lighter drill with a more flexible stroke. It is estimated that on the Rand, compressed-air power costs 600,000 dollars per annum and drill maintenance 300,000 dollars, and of this about 500,000 dollars might be saved. In July, 1915, there were 9,831 drills on the Rand, 6,410 being in daily use. If the Haddon rock drill in its piston- or hammer-drill form proves an economic success over a lengthy under-ground trial, its introduction into mines throughout the world will no doubt take place. It must, however, be remembered that for certain work and in certain situations the exhaust air from the air drill is of priceless value in ventilation and that the expense of providing an adequate alternate system must be charged against any substitute. This matter will no doubt be adjusted, but the merits of the wave-transmission system as applied to mining would be that in any mine a simple power unit (apart from the generation of some electric light) could transmit all its energy into wave transmission and all the work of the mine in stoping, driving ventilation fans, hoisting, pumping, rock-drilling and underground haulage could be arranged in the one system. The possibilities of reduction of costs thus shown are enormous, and the fuller economic development of this system, which is of course much hindered by the war, will be watched by all mining engineers with great interest. One of the leading houses on the Rand has subscribed for and is giving all facilities for an extensive under-ground test with several machines of different designs. These tests are expected to take place toward the end of the year in one of the large mines of the Rand, and the results obtained will be looked forward to with interest by all mining engineers.

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Company Meetings.

OCEANA DEVELOPMENT CO.

An extraordinary general meeting of the Oceana Development Company, Limited, was held on January 15, at Winchester House, Old Broad Street, E.C., for the purpose of considering, and if thought fit passing, a resolution approving an agreement for prospecting and proving, by boring or other mining work, the farms Koppieskraal and Eendracht, situate in the mining district of Heidelberg, South Africt.

Mr. Reginald C. Bromhead, C.A., presided, and there was a large attendance of shareholders.

Mr. Leslie C. Lawson (secretary) read the notice convening the meeting.

The Chairman expressed regret at the absence of Mr. H. C. Emery, the chairman of the company, owing to a severe attack of influenza. Continuing, he said:—When we had the pleasure of meeting you in May last we expressed the hope and belief that before very long arrangements might be concluded for boring on our two farms, Eendract and Koppieskraal, without cost to our company, and at the same time reserving to ourselves a substantial interest in any company formed to work the properties. It was not very long after that meeting before an introduction was offered us, which, however, subsequently proved abortive. A further introduction was more fortunate, and negotiations were commenced and continued for many months, resulting in the settlement of the terms of the agreement which you are now asked to approve, and which it is proposed to enter into for the exploitation and subsequent flotation and development of these two farms. There is one point in our circular I should like to refer to before dealing with the terms of the agreement, and that is the omission of the names of the parties who are to undertake the carrying out of its obligations. As far as we are concerned, we should have been only too pleased to have made this public, but it was made a stipulation by the other side that, until the agreement had been approved by the shareholders, and actually executed by all parties, no names should be disclosed. So far as possible, we have assured ourselves of the capabilities of the parties fully to carry out the terms, and so soon as the agreement is executed we shall issue a circular to members disclosing the names of the contractors.

THE AGREEMENT SUMMARISED.

The agreement may be summarised under two headings: first, the undertaking to bore to a given depth within a given period; secondly, the exercising of the option to acquire the mining rights. The basis of the agreement is that the contractor undertakes to expend within a period of two years from the approval of this agreement in general meeting a minimum sum of £10,000 on boring or other mining work, with a view to the location of a payable gold reef; secondly, that unless such a reef is located at a lesser depth the boring must continue to a depth of 3,500 feet. Boring operations are to be commenced not later than five months from the date of this meeting. The contractor, having duly fulfilled his obligations, may exercise the option granted to him to purchase the gold mining rights appertaining to these two properties, by the formation of a mining company with a capital of £600,000, whereof one-third is payable to us, one-third to the contractor, and the remaining one-third—that is, £200,000—is reserved for cash working capital. Of this £100,000 has to be absolutely guaranteed by the contractor. The remaining £100,000 is under option to us at par. Under these arrangements we shall, therefore, hold a minimum of one-third of the capital of the new company, and if we exercise our option to subscribe for our share of the working capital our interest will increase to one-half. In any future issues of capital made by the mining company we have stipulated that the shares shall first be offered to the then existing members at par. That is the position aimed at and secured if the option is exercised. We particularly wish you to note that we maintain our position as owners of the freehold of this property, which asset should prove a very valuable one to us as the district develops. We thought it advisable that some provision should be made in case for any reason the contractor was unwilling to proceed with the expenditure of the whole of the money, which was fixed, as a minimum obligation, at £10,000. It is, therefore, provided that if he fails to proceed with the obligations of his contract he shall subscribe at par (that is, 10s. per share) for as many shares in the capital of this company as shall be necessary to give us, in cash, the difference between his actual expenditure to date and the sum of £10,000 contracted for. On the other hand, should he expend the whole of his money and meet his obligations to that extent, and fail to attain success, we agree to allot to him £10,000 of our capital fully paid up. We do not anticipate either of these contingencies arising, but we considered them fair and equitable to both parties, and necessary to be provided for. In consideration of the introduction we have passed a commission note of 5 per cent. on our purchase consideration, which, of course, only becomes payable as and when the purchase price is received by us. The board of directors of the mining company is first of all to consist of five members, three to be nominated by the guarantors and contractors, and two by ourselves, an additional seat being reserved to us if we exercise our right to subscribe our portion of the working capital.

WHAT SUCCESS MAY BRING.

I am not going to consider any question of failure, because we don't believe in it, but I am going to give you a few figures of what success may bring to us. As we have pointed out in our circular, we shall be entitled to mynpachts, or exclusive mining areas, equivalent to 2,070 claims, which may be increased to 2,250 by the addition of discoverers' claims. Now, what ultimate value may be assumed from the location of the Van Ryn reef with payable values under that area? There is only one general method of computation, and that is by comparison with some of the deep level mines already working on that formation in the far East Rand. The present market valuation of the Springs Mine, which commenced crushing a few days ago, is about £2,350 per claim: Brakpan, £3,500 per claim: Modder B, £1,000 per claim; New Modderfontein, over £6,000 per claim; and Modder Deep, nearly £10,000 per claim. The average valuation of these five mines works out at over £5,000 per claim, and it is admitted, and even urged, by competent authorities, that a still higher valuation is justified and will be attained. Those figures multiplied by our claim area indicate the possibilities which success holds out for us, and will emphasise to you the desirability of our not being satisfied merely to retain our vender interest; but, if possible, that we should take up our proportionate part of the working capital of the mining company at par, and thus take full advantage of our rights. It is with that object in front of us, and for that object solely, that we are asking you to empower us to increase the capital of your company to such an extent as may be necessary to maintain our interest at its full measure. Opportunities arise, sometimes when least expected, and, if not quickly grasped, are often lost, or their return long deferred. Those of you who are intimately associated with finance and the Stock Exchange realise the enormous benefit accruing to him who can act promptly and clinch a bargain without delay. We desire that you should put us in that position, accepting our assurance that the individual as well as the collective interests of the shareholders will remain paramount in the exercise of our discretion. The agreement now before you is the outcome of many months' work, and of protracted negotiation on the part of your board, who have given very serious thought and consideration to every clause. Under all the circumstances, we are of opinion that the terms arranged are likely to prove very beneficial to your company, and we have no hesitation in recommending them to your acceptance.

EFFORTS OF THE NEW BOARD.

At the time that we assumed office, under circumstances of which you are well aware, we came to the unanimous conclusion, after investigation of affairs, that the resources of your company had not been concentrated upon its principal asset, namely, your landholdings in South Africa, but were being frittered away upon extraneous side issues of a speculative nature. We took every step in our power to remedy this state of affairs, and our efforts have since been devoted to turn to account the potentialities of your farms. The first results of these efforts, gentlemen, are now before you. The other matters referred to in the notice convening this meeting are principally administrative, but I shall be pleased to enlarge upon any clause which may have particularly attracted the attention of any member. The articles of the company are now nearly 25 years old, and require revision in many directions. Our remark, that the general financial position of the company has been much improved, does not exaggerate our successful efforts in that direction; but, as our accounts are made up to December 31 last, and will be submitted to you before many weeks have passed, I do not think I need anticipate or deal now with the figures which will then be laid before you. I will first move the resolution for the approval to the agreement. Then I will ask Mr. Parker, our solicitor, to read to you an abstract of the various clauses of the agreement. We can then discuss the matter, with the full particulars fresh in your minds.

Mr. S. S. Kennedy seconded the resolution.

The solicitor (Mr. Parker), having read a digest of the agreement, a short discussion followed, after which the resolution was unanimously agreed to.

A resolution amending the articles of association in several respects was also passed, and the proceedings closed with a vote of thanks to the chairman and directors.

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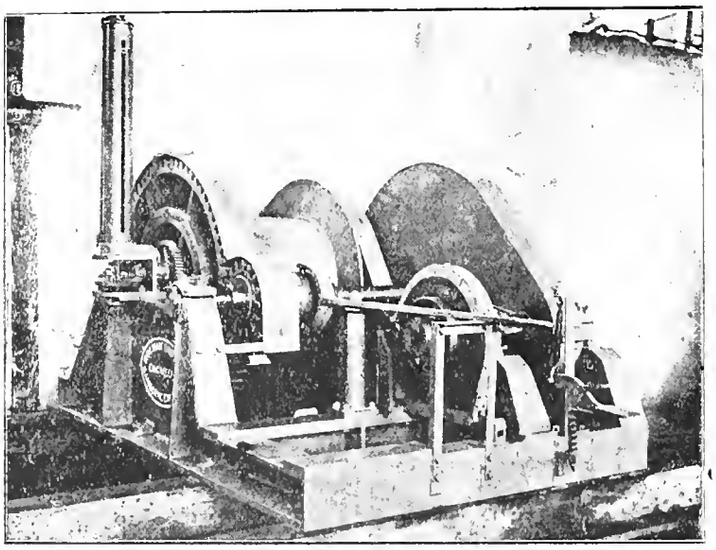

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